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Status of Grain Storage In Developing Countries

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STATUS OF GRAIN STORAGE IN DEVELOPING COUNTRIES

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PREFACE

This report was undertaken as a first attempt at gathering data available on grain storage capacities and locations in developing countries throughout the world.

The project, Contract AID-otr-C-1331, "Status of Grain Storage in Developing Countries," was undertaken by the Food and Feed Grain Institute at Kansas State University in conjunction with Contract AID/ta-C-1162 Technical Assistance in Grain Storage, Processing and Marketing and Agribusiness Development.

The text of the report presented here is based on literature reviewed in preparing the appendices which form a part of this report and personal experiences and observations of members of the team of specialists assembled at Kansas State University under Contract AID/ta-C-1162. Since references to the data are cited in the appendices, a separate bibliography is not included. Where reference is made in the text to specific situations, sources are footnoted.

Much of the tedious work of researching publications, reports, and other documents for data was done by Dr. Menter David, Research Assistant and Mr. William E. Pursley, Graduate Research Assistant. Assistance of secretaries in typing and proof-reading the manuscript and the appendix data is also greatfully acknowledged.

We want to especially thank Mr. Dana Dalrymple, AID/PPC/PDA for his assistance in development of this project and in obtaining much valuable data from U. S. Agricultural Attachés in many countries.

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STATUS OF GRAIN STORAGE IN DEVELOPING COUNTRIES

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INTRODUCTION

In recent years considerable emphasis has been placed on increasing the production of the world's cereal supply to meet the needs of our growing population. High yielding varieties of rice and wheat have been developed and in some areas of the world have materially increased the available food supply. Attendant with the increased food supply is the problem of how and where to store the commodity until it is consumed. Unfortunately, in many situations where production has increased we have not had the foresight to plan ahead and provide the necessary storage facilities. In many of the developing countries storage facilities under normal conditions are inadequate in quantity and quality. Under conditions of stress, such as dramatic increases in production or the current Sahelian catastrophy, the status of the current grain storage situation in developing countries is brought into sharp focus.

The purpose of developing a paper such as this was to focus on the current overall grain storage situation in developing countries. Two goals were in mind. First, as much data as possible was to be assembled on capacity, location and types of grain storage currently available in developing countries throughout the world. Secondly,

storage conditions, problems and deterrents to progress were to be considered.

It has to be acknowledged that a complete cataloging of all existing storage facilities is not presented in this paper. Within the time space spent in gathering information for this paper it was impossible to locate and bring together all of the information that exists on grain storage capacities, locations and types. Much of this information is available only from cereals offices or ministries of agriculture, commerce or statistics within a specific country. Where data does exist, it is often difficult to obtain because it may be considered privileged or strategic information by the holder. In most developing countries the data is incomplete and in many, the data simply does not exist.

Data reported in this paper has been obtained primarily from reports, studies, and papers dealing with various aspects of grain storage in the developing countries. In some cases, data were obtained from official records or statistics. A conclusion drawn during preparation of this paper is that a need exists for a much more thorough and comprehensive effort in compiling data on grain storage capacities, locations and types in developing countries and that such a study should be undertaken by a multilateral international organization.

THE NEED FOR STORAGE

In 1973, 1,223,096,000 M.T. of cereal grains (rye, oats, barley, wheat, rice, maize) were estimated to have been produced world wide.[1] This figure does not include grain sorghum or the oilseeds or pulses. The cereal grains, for the most part, are seasonal with from one to three crops produced each year. The fact that these crops are seasonal and harvested at certain times of the year necessitates holding them for varying lengths of time to provide as uniform a year round supply as possible to consumers. In countries where agriculture is primarily at the subsistance level, farm storage is a necessity. In this type of economy only small quantities of cereal grains are marketed, however, storage for that which is marketed must be provided, usually in urban centers. In many countries the major source for urban population supplies is imports. Storage for these supplies must be provided until delivered to the consumer.

Some of the developing countries have recognized the need for building strategic reserves wherein large quantities of grain may be stored for extended periods of time. Kenya, for instance, implemented approximately 100,000 metric tons of reserve maize storage at Nakuru and Kitale in 1968.[2] Just recently President Ford of the United States in his address to the United Nations Assembly recommended the establishment of international food reserves to help alleviate situations such as the food shortage experienced because of the Sahelian drought.

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1) World Agricultural Production and Trade - Statistical Report. Foreign Agriculture Service, U.S.D.A. March 1974 & June 1974.

2) FAO, Commodities and Trade Division, 1974.

BASIC PROBLEMS IN STORING GRAIN IN DEVELOPING COUNTRIES

To document the need for grain storage is a simple task· providing storage and technology that is capable of maintaining the quality of cereal grains in the various developing countries is a more complex undertaking.

The Storage Environment - Most of the developing countries are in parts of the world characterized by climates that do not favor the safe storage of grain. High temperatures and humidities exist over extended periods of time making the potential for deterioration due to insects, molds and rodents extremely high. With the best of facilities, storage of grain under tropical conditions is a difficult task.

Education and Technology - In many of the developing countries the individuals responsible for storing grain are not completely aware of the hazards involved. They may not be aware of the physical losses (loss in weight) that occur in grain during storage due to insects, rodents and molds and probably are not aware or concerned with the contamination in the form of urine, excrement, hairs and toxins that can occur as the result of insect, rodent and mold infestations. The presence of insects in grain and rodents in and about storage facilities in many areas is common and probably considered by the individual as one of the necessary evils of grain storage. It probably never occurs to many storing grain that in addition to the physical losses that occur, there are biochemical changes which occur in grain stored under adverse conditions which

materially reduce the nutritional quality of the grain as a food for humans and animals. Loss of vitamins, degradation of carbohydrates, proteins and fats, and production of toxins do occur when grain is improperly stored.

Moisture is probably the most important factor involved in maintaining the quality of grain in storage. High moistures favor the development of insect and mold which in turn cause grain to heat and deteriorate. Low moistures favor the maintenance of good quality grain. This relationship between moisture, grain and the factors of deterioration (insects, molds, etc.) are not completely understood by many. In relatively arid regions of the world considerable quantities of grain have been lost and certain types of storage structures incriminated because persons reponsible for storage were unaware of the relationships between moisture and grain and the "management" practices necessary to maintain the grain. This is more likely to occur when grains are imported and received at higher moisture levels than are customarily handled. This is a factor which should be given considerable emphasis with respect to the large quantities of cereal grains being moved into the Sahelian region.

The manner in which grain is "managed" or maintained in storage is a product of the technological knowledge of the individual responsible for storage. Large quantities of cereal grains are lost in the developing countries because of improper storage techniques. Improper stacking of bagged grains can prevent (1) proper inspection of the commodity to determine whether deterioration is occurring, (2) successful fumigation of the commodity if necessary, and (3) natural ventilation in and around the grain to carry off heat which may be produced in grain of marginal moisture contents.

Use of facilities which are unsound from the standpoint of excluding rain, ground moisture, rodents, etc. also leads to the deterioration of considerable quantities of stored grains.

Loss estimates for stored cereal grain are cited anywhere from 5 to 50 percent for many of the developing countries. At best, these figures are "estimates" and in only a few cases are documented studies available to show actual measured losses. We oftentimes tend to observe the more spectacular or dramatic losses that occur and this can lead to "over-estimating." There are proponents also who will argue, from good information, that losses are actually more severe than reported. What this situation indicates, it seems, is that we do not have the reliable type of information needed to accurately assess the losses that occur. Many of the loss surveys that have been conducted are based on information gathered by interview. Considerable opportunity for bias can be injected into surveys of this nature although they provide a fairly expeditious manner of gaining information. More elaborate studies have been designed for actually sampling lots of grain in storage in various types of facilities. These studies are time-consuming and are not entirely without bias. Researchers may be reluctant to report actual observations if the possibility of embarrassing the government or official organizations exists.

These are some of the basic types of problems that can and do exist in storage of grains in developing countries.

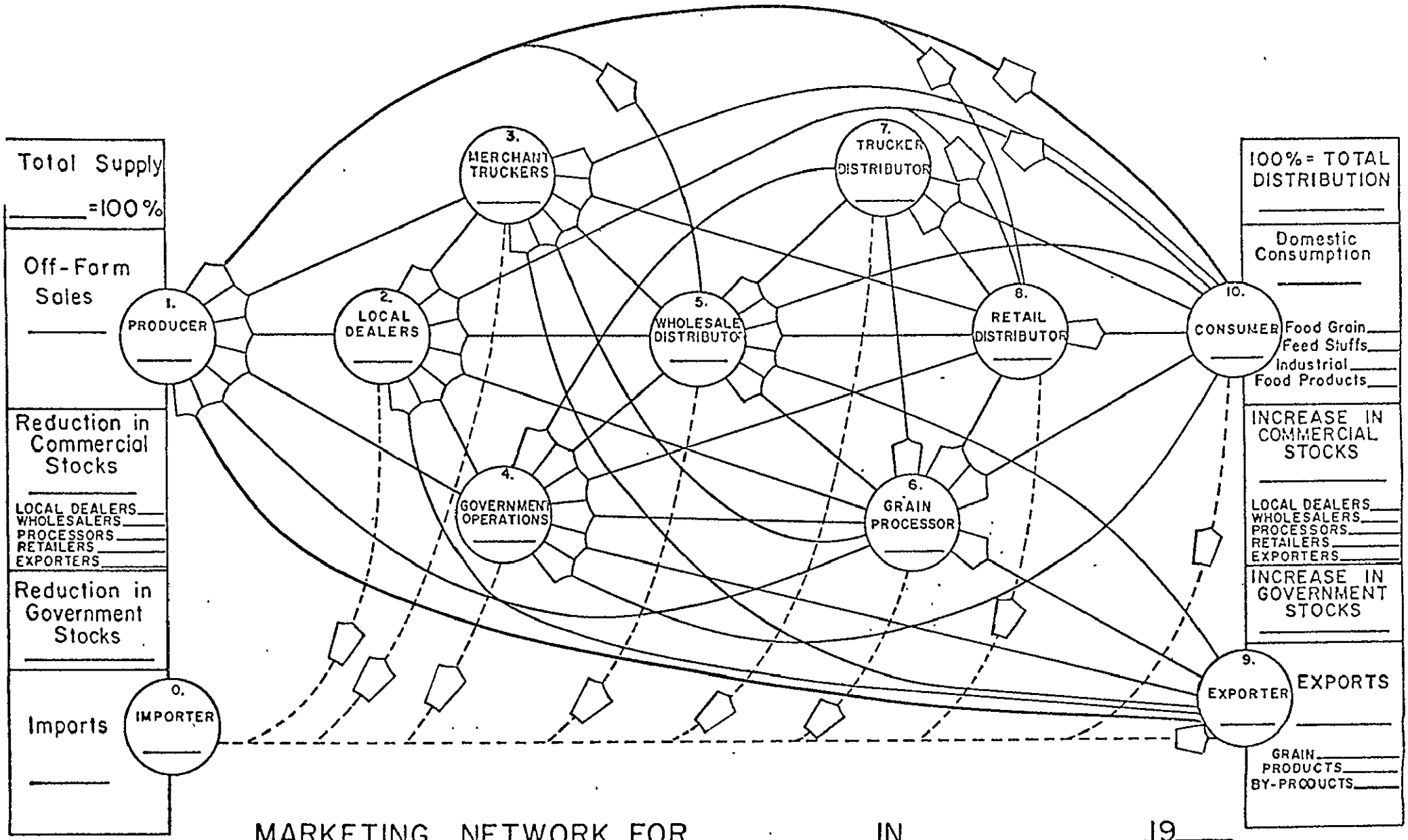
STATUS OF STORAGE AT STAGES IN THE FLOW OF GRAIN FROM PRODUCER TO CONSUMER

As grain flows from producer to consumer in developing countries there are a multitude of paths which may be followed. Figure 1 is a diagramatic work sheet which illustrates the complexities which may be encountered in this flow. No two countries seem to have the same marketing pattern or network. Whatever the pathway grain takes from producer to consumer, it is inevitable that it be stored at one or more points in this flow.

Farm Storage - The simplest pathway or situation is where the producer holds grain on the farm for his own consumption. In the developing countries, quantities held on the farm generally range from 70 to 90 percent of the total production. There are exceptions of course where, for instance, all of a farmer's rice may be sold to mills at harvest time and purchased back as needed. However, the general rule is for the major portion of grains produced in developing countries to be stored on farms.

Since the bulk of a country's cereal food supply is stored on the farm it seems ironic that this level of storage has probably received the least emphasis as far as improvement or consideration. This is reflected in the information that is available on farm storage of grain. In compiling the information in the Appendix of this paper, the lack of data on farm storage is quite obvious. Granted, tabulation of data on farm storage capacity is a difficult task because of the large numbers of farms in developing countries and the great diversity in type and size of farm storage facilities.

FIGURE 1. GRAIN MARKETING FLOW PATTERNS.



There are descriptions in the literature of various types of farm storage facilities used in developing countries. In the vast majority of cases, indigenous materials are used in fabricating storage containers. To cite all of the various types of storage containers would create a paper in itself. A few examples will serve to characterize farm storage structures currently in use. In Mexico, maize on the ear and on stalks may be stored cradled in tree or cactus branchs. In many Asian countries maize in the ear or rice and sorghum in the head may be suspended by rope or wire in huts over cooking fires. In many African countries small quantities of grain may be stored in dried gourds or other small containers. In Morocco, Jordan and India cereal grain is stored in underground pits. In many African countries ear maize is stacked on platforms and covered with thatch to ward off rain. In many of the developing countries bags of cereal grains are stored within human dwellings. In some areas mud-plastered woven baskets form bins for bulk grain or wooden bins are used, generally elevated on posts to secure the grain. Discarded oil drums have also been placed in service as grain storage containers.

At best, farm storage in most of the developing countries leaves grain supplies vulnerable to insect, rodent and bird depredation and, in those areas where high temperatures and humidities exist, to deterioration due to molds.

Quantity wise, farm storage in developing countries will range from a few hundred kilos to a few tons total.

Research is underway in some areas to develop improved storage facilities for farm use. Use of butyl rubber or plastic containers

strengthened by welded mesh steel is being employed in parts of Africa. This system can produce nearly airtight storage conditions. In Thailand, the Applied Scientific Research Corporation has developed a ferro-cement unit called the "Thailo."[1] Capacity of the unit can range from 2-5 metric tons. In Nepal, a poured concrete unit has been proposed.[2] Steel forms are loaned to farmers and construction is accomplished by the farmer and unskilled labor with assistance from a trained individual.

One of the main weaknesses in developing new types of storage facilities for farm use in developing countries has been the lack of economic consideration. Can the farmer afford to buy metal or rubber storage or build the "Thailo" or poured concrete bin on his farm? Costs for these units have been variously estimated at between $120 and $200 per unit. No one appears to have asked the question whether the farmer can afford to pay the cost of improved storage. Perhaps he is better off (financially) to absorb the losses he experiences rather than invest in improved storage.

Other instances of farm storage research could be cited, however, the main point of emphasis here is that dollar-wise considerably more effort has been expended in the development of large scale modern storage silos and warehouses than has been devoted to farm storage even though only 10 to 30 percent of the grains produced will ever reach these facilities.

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1) National Academy of Science (1973) Ferro-cement: Applications in Developing Countries. Washington, D. C. February 1973.

2) Pfalser, Donald F. (1972) Storage Drying and Transportation of Agricultural Commodities MFA Agr. Mktg. Conf. Document No. 12. Agricultural Marketing Conference 21-24 February 1972 Kathmandu, Nepal.

Although there is often an expressed interest, on the part of governments, in the need for improved farm storage it has become apparent that major emphasis is usually directed elsewhere. Most of the studies on farm storage have been conducted and/or financed by multilateral international organizations. Some studies have been conducted by individual countries however, such studies are the exception rather than the rule.

Village Level Storage - Very little information is available on village level storage. Indications are that most of the facilities utilized at the village level do not vary significantly from those on the farm. Many persons consider farm and village level storage as one and the same. Village level storage referred to here is that maintained by local merchants or dealers.

Grain may be held in baskets and/or bags and stored in various types of structures usually shops or storage rooms of indigenous construction. Security from insect, rodent and bird attack is usually comparable to that on the farm.

Cooperative efforts on the part of farmers in a few developing countries have resulted in the development of improved community-type storage facilities, however, this form of cooperation is not widespread.

Village level storage or trading of grains can form the first link in the movement of grain off the farm into major marketing channels. Lack of development of these "first collection points" in the flow of grain from producer to consumer has been one of the major deterents to the success of some grain stabilization programs. The existence of poor storage facilities at this level is not the main

draw-back, but rather the lack of development of a marketing system, i.e., roads, transport facilities, grading systems, market news, etc. The weakness of this link in the overall flow of grain from producer to consumer is in part responsible for large elevators that have been constructed in developing countries standing empty or not being fully utilized.

It is encouraging to note that there is an increased interest developing in this vital link in the grain storage and marketing system of developing countries - the "first collection point." Countries such as Tunisia, Philippines, and Peru are currently requesting assistance from Kansas State University in this particular area. Serious consideration is being given to the development, design and location of grain collecting stations which will allow reasonable access to the market by farmers. The ultimate success in the development of these collecting centers will be the parallel development of transportation facilities, grading systems, warehousing laws, credit availability and other market associated functions.

Private and Commercial Central Storage - Much of the grain that enters marketing channels in developing countries is currently moved directly from farms or villages to processing plants or to central dealer storage. Truck dealers or processors' agents move out into the producing areas at harvest time and secure grain at the lowest possible prices and move the grain directly into private and/or commercial central storage. Information on capacities and conditions of central or wholesale dealer storage facilities are virtually nonexistent. Development of warehousing laws and licensing could do much to consolidate valuable information on this sector of the grain marketing system in developing countries. In most of the developing countries, storage facilities utilized

by this sector of the grain trade consist of warehouses of various types of construction for storage of bagged grain.

Some information does exist on storage at large scale processors such as rice mills, flour mills etc. for some countries. This is generally true in those developing countries which are the more advanced. Most of the grain at the processor level is stored in bags by necessity since grain for the most part is handled throughout the marketing system in bags. Some processors are developing bulk storage at their facilities but, in general, this is the exception rather than the rule. Where grains such as wheat are imported for processing it is more likely that bulk storage and handling equipment will be available especially if the processing facilities are at port locations. A considerable amount of "outside" or uncovered storage may exist at rice and/or flour mills, this depending on climate and whether large grain stocks are maintained at the processing facility.

The quality of storage at private and commercial central storage can range from very poor to excellent and is dependent, in part, on the level of knowledge possessed by those responsible for the grain. In general, one would expect private or commercial dealers in grain to be the most conscious of the cost and importance of maintaining grain in good condition. If the general atmosphere in the grain trade within a developing country is one where good quality grain does not command a premium, storage conditions will probably reflect this attitude. Private dealers who may enter world trade by exporting grains will be more aware of the necessity for maintaining the quality of their commodities in storage.

Government Storage Operations - By far the greatest amount of data available on grain storage capacities and conditions in developing countries is on government storage operations. This is evidenced by the extent and type of information accumulated in the appendices of this paper. This is understandable since government operations are usually documented and these records often become public information. Sources of data presented here, in many instances, have been derived from studies developed in support of various types of government grain storage and marketing programs in which considerable effort has been expended in bringing together the available information on the various aspects of storage.

In most government operations, storage facilities are used in support of grain purchasing, stabilization and/or reserves programs. Depending on the particular country and government operation, storage facilities will range from small, mud warehouses to very elaborate, large-size bulk handling silos. The larger storage facilities (warehouses and/or silos) are generally located in the major consumption centers and at port locations. Government maintained, smaller facilities are usually located at minor consumption centers and are used for either collecting grains or distributing them to the population.

One of the major problems confronting many of the developing countries is the determination of how much, what type and where storage facilities should be located. The presence of large storage facilities standing idle or underutilized in many countries is evidence that proper planning and implementation of storage programs in the past has not been completely successful. Too often the impressiveness of a large silo may overshadow the necessity for a more practical type of facility for the existing situation.

In some instances, construction of large scale grain handling facilities have been justified on the basis that their existence would generate increased production on the part of farmers. Unfortunately, very little or no consideration has been given to how grain will move from the producer to the storage center which may be several kilometers distance. There has been little or no effort given to development of "first collection point" facilities and the supporting functions required for the orderly flow of grain from the producer to major storage centers.

It would appear that government organizations responsible for storage of cereal grains would have access to and utilize the technology that is available to safely store grains. Much of the deterioration and loss of grain that occurs in storage is not a result of poor facilities but rather poor management of the grain in storage. In responding to over 40 requests for technical assistance in grain storage and marketing problems, one of the most common deficiencies our staff members have noted is the lack of knowledge on the basic principles of grain storage. Personnel responsible for storage of cereal grains in many instances are not aware of grain-moisture relationships, basic sanitation practices and storage practices which are paramount to safe storage of grain. This not only applies to government operations, but to all levels of storage. In some instances, the lack of basic knowledge on grains in storage has lead to incrimination of the type of storage for losses rather than the management methods. This is especially true in the case of metal storage facilities.

Reference has been made to idle and/or under-utilized storage facilities in developing countries. In addition to improper planning, a common reason for non-use of these facilities can be attributed to personnel being inadequately

trained in the operation and maintenance of the facilities. In some cases, bulk storage facilities have been "over designed" and provided with equipment much more sophisticated than necessary. This results in increased maintenance requirements and the need for more highly trained operators.

Not all of the problems encountered in government operations in grain storage are technological in the developing countries. In some countries administrative problems may rival the technical problems. It is not uncommon to have more than one department or branch of government involved in the storage of grain. This may involve departments of agriculture, commerce, transportation, etc. or units within departments. Usually the difficulties arise because of lack of communications. Open lines of communication and cooperation should be developed to insure maximum utilization of storage facilities and minimum losses of grain in storage.

Application of Pest Control Measures in Grain Storage - From producer to consumer, no matter what the storage level, there are pests encountered. Reference has already been made to the losses that occur due to the biological factors of deterioration - insects, rodents, birds, and micro-organisms. It is obvious that if the losses which occur could be reduced, this would materially increase our food supply. Reduction of losses through improved storage facilities has been used for justification of the new facilities, however, new facilities in themselves will not prevent losses. In most cases, improved facilities will make reduction of losses easier, but there is a major need for applying an integrated program of pest control measures as part of the grain management program. No one method of pest control in itself is sufficient and a combination of methods must be used.

Where pest control methods are employed in developing countries, major emphasis has been placed on the chemical aspect - insecticides and fumigation. There are a variety of ways in which pests can be controlled other than with pesticides. Use of inspections, application of good sanitation practices, control of the storage environment plus the use of pesticides provides an integrated approach to the pest control problem.

In many developing countries there is little or no attention paid to good housekeeping and sanitation practices in the storage of cereal grains. Some government and private operators have realized the importance of good sanitation, however, generally poor sanitation conditions prevail at all levels of grain storage in developing countries. Improved sanitation would probably be one of the least costly methods for reducing grain losses if the proper information could be disseminated and applied.

At the farm level, the use of chemicals in grain preservation is virtually non-existent. There have been programs in certain countries to promote the use of insecticide dusts of various types but these programs have met with varying degrees of success. Certain unique methods for preserving grain at the farm level are used. Methods of storage such as suspending grains over cooking areas in dwellings to take advantage of the drying effect of the heat would tend to reduce losses due to insects and molds. Unfortunately, the unique practices employed are usually over-shadowed by the poor sanitation conditions which commonly exist under farm situations.

Rodent control on farms is hindered by the fact that many of the storage structures may actually serve as rodent harborages.

Few, if any, attempts are made at controlling pests in the local dealer or merchant facilities. Usually the grain does not remain at this level in the marketing system for extended periods of time. Poor sanitation conditions are the rule rather than the exception at this level of storage.

At private and commercial central storage facilities, the application of pest control measures is dependent on the attitude of the storage management. At this level of storage, where large quantities of grain may be held for varying lengths of time, chemical pesticides are used, primarily in the form of fumigants. The extent of their use is not well documented. Here again, sanitation practices are often poor and storage practices are variable.

In many of the developing countries, processors do not store large quantities of grain for extended periods of time. Most rely on supplies from government or commercial storage operations. Very little emphasis appears to be placed on pest control measures at this point.

Government operations in many of the developing countries are more aware of the need for applying pest control measures than others storing grain. Long term storage of grain reserves has made it a necessity that pest control measures be applied to prevent large scale losses. Here, as in commerical storage, the emphasis has been on the use of chemicals in the form of insecticide dusts and fumigants. Good sanitation and management practices have not been stressed to the fullest extent in most of the developing countries. Certain countries, such as Kenya where large air-tight storage structures have been constructed, are looking to other alternatives of pest control.

AVAILABILITY OF STORAGE WORLDWIDE

A beginning attempt has been made, in the development of this paper, to bring together data on storage capacities, locations and types that exist throughout the world in developing countries. Data that has been accumulated in this effort is assembled in appendices which represent the following four regions of the world - Africa, Asia, Latin America, and Near East-South Asia - and form a part of this report.

Review of data contained in these appendices will indicate the general incompleteness of this type of information that is readily available. It is hoped that this first attempt will stimulate a more in-depth study of the availability of existing storage facilities in the developing countries. This is considered an important undertaking in view of the possibility of the development of international food reserves. An undertaking of this type could most likely be best accomplished by a multilateral international organization.

NEED FOR THE FUTURE

There are many areas of concern which need to be given greater emphasis in the developing countries in the future. Four of the major areas needing primary emphasis are:

LOSSES - It is obvious that losses do occur. The true extent of these losses has not been accurately determined. In view of the importance which is placed on reduction of losses in storage and the importance placed on losses as justification for large scale investment in storage facilities, it would appear that a sound basis for stating the extent of losses should be developed.

FARM STORAGE - Since the major portion of the total grains produced in in the developing countries is stored on farms, a greater emphasis should be placed on development of improved farm storage methods and facilities which are economically feasible.

FIRST COLLECTION POINT SYSTEM - That segment of the grain marketing system which will allow the farmer to conveniently deliver excess production into the market system with reasonable assurance of obtaining a fair price for his grain needs to be given increased emphasis. This is a segment of the marketing system which has, in part, been responsible for impeding increased production and the flow of farm grain into the marketing system.

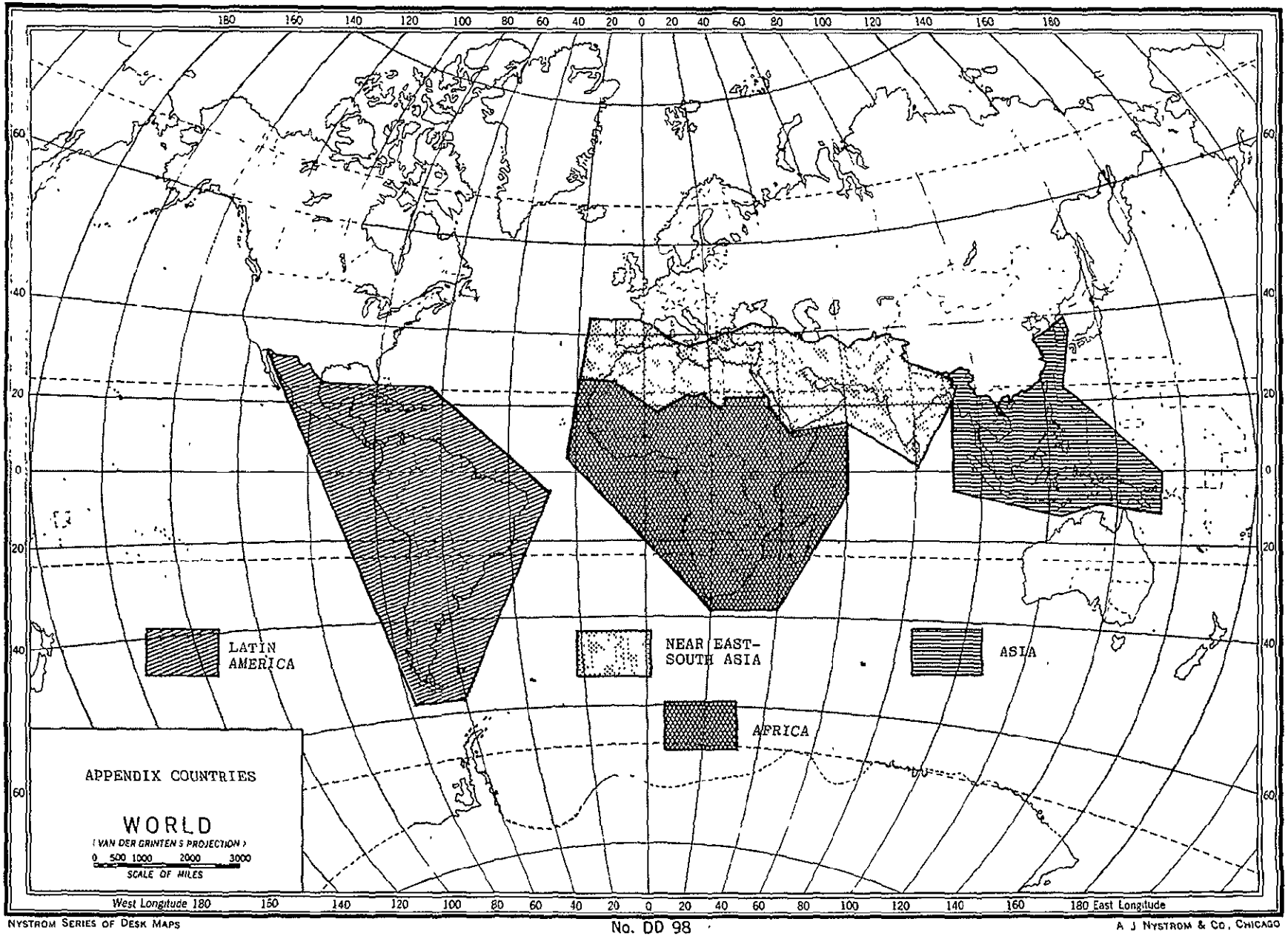
PROJECTION OF NEEDS FOR STORAGE FACILITIES AND FUNCTIONS - Greater emphasis needs to be placed on the systematic evaluation of developing country needs for storage. Sound judgements, based on evaluation of all factors bearing on grain storage and marketing, must be made in recommending future needs for storage facilities and functions. Thorough evaluation and planning should be directed at reducing the possibility of building grain storage facilities which become idle "monuments."

SUMMARY

As stated, the main purpose of this undertaking was to assemble as much information as possible on the capacity, location and types of grain storage currently available in developing countries throughout the world and to consider the storage conditions, problems, and deterrents to progress.

One of the main conclusions drawn from the effort reported here is that data on storage capacities and locations for many of the developing countires is not readily available. In some cases it is probably non-existent. It is recommended that in view of the potential for development of worldwide grain reserves a more complete study be undertaken by a multilateral international organization.

In general, improvement is needed in grain storage at all levels in the movement of grains from the producer to the consumer--farm, village, commercial, processor and government. Problems encountered in storing grains safely are of a biological, economical and political nature. Probably the greatest deterrent to safe storage of grains in developing countries is the lack of knowledge of the factors causing deterioration of grain and proper "management" of the grain.



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THE APPENDICES

The bulk of this report is made up of a series of appendices representing four areas of the world--AFRICA, ASIA, LATIN AMERICA and NEAR EAST-SOUTH ASIA as shown on the map on the opposite page.

The Appendices are color coded as follows:

AFRICA	-Buff
ASIA	-Blue
LATIN AMERICA	-Yellow
NEAR EAST-SOUTH ASIA	-Green

Within each Appendix, countries are indexed alphabetically and numbered. Countries for which no data on storage capacities was obtained, we indicated as "no data" in the index. Where data was obtained, it is presented in the designated appendix.

Sources of data are indicated as completely as possible in each individual appendix.

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BOTSWANA

No data are presented here for farm or other grain storage capacities. Any bulk storage of grain for Botswana would generally be handled in South Africa.[1)]

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1) Personal Communication, U.S. Agricultural Attaché, Pretoria, February 19, 1975.

CHAD

No data is available on farm storage methods or facilities.

Data included, on public and private storage facilities, is the most recent information available.

Additional information on Chad can be found in Africa Appendix 42 Entente States.

PUBLIC AND PRIVATE STORAGE FACILITIES IN CHAD

Prefecture	Locality	Type of Storage	Tonnage	Remarks
SALAMAT	Am-Timan	Silo	100 t	
	Aboudeia	Storehouse	300 t	
	Dagor	Silo	100 t	
	Abgué	Silo	600 t	
GUERA	Mongo	Storehouse	700 t	
	Baro	Silo	200 t	
	Erref	Silo	200 t	
	Noyeye	Silo	200 t	
	Melfi	Storehouse	300 t	
	Massalasief	Silo	100 t	
	Doguela	Silo	100 t	
	Bitkine	Storehouse	200 t	Roof to be repaired
	Ab Touyour	Silo	200 t	
	Mokulu	Silo	150 t	
	Korbo	Silo	2 500 t	
BATHA	Ati	Silo	650 t	including the new storage floor
	Ati	Storehouse	400 t	to be restored
	Fitri	Storehouse	200 t	
	Djeddaa	Storehouse	500 t	
	Oum Hadja	Storehouse with 10 silos	1 000 t	
		1 silo	400 t	
	Mangalme	1 silo	200 t	
	Andak	1 silo	200 t	
KANEM	Mao	3 storehouses	400 t	
	Moussoro	1 storehouse	300 t	
		Silo	700 t	

Table Continued

Prefecture	Locality	Type of Storage	Tonnage	Remarks
CHARI-BAGUIRMI	Massakory	4 storehouses x 200	800 t	
	Bokoro	4 storehouses x 200	800 t	
	Bousso	2 storehouses x 200	400 t	
	Massenya	2 storehouses x 200	400 t	
	N'Djamena	Miscellaneous	550 t	including the new EDF storage floor
OUADDAI	Adré	Storehouse	100 t	
	Abéché	Silos 100 t		
		Silos belonging to the administration 240 t		
		Storehouse 200 t.		
		Sonacot (FDAR) 200 t		
		Sheds 400 t		
		EDF storage floor 450 t		
			1 590 t	
BILTINE	Biltine	Storehouse	210 t	
	Iriba	Storehouse	150 t	
		TOTAL:	23 200 t	

REFERENCE: "Chad," from Summary Report of the Multi-donor Mission to Assess the Food AID Necessary in 1973-74 Drought-stricken Sahelian Countries (Chad, Mali, Mauritania, Niger, Senegal and Upper Volta) FAO Conference Seventeenth Session, Rome, November, 1973.

DAHOMEY

See Entente States.

ETHIOPIA

The available capacity of the Ethiopian Grain Corporation (EGC) in November 1974 was reported as 62,450 M.T. (See attached table). Bulk silo capacity owned by EGC totals 29,000 M.T.; a 20,000 M.T. silo at Addis Ababa consisting of a double row of 500 M.T. bolted steel plate bins, a central headhouse with cleaners and scales, fully mechanized and with temperature measuring equipment; and 9,000 M.T. at seven sites in groups of 1,000 or 2,000 M.T. country silos consisting of 200 M.T. bolted corrugated metal bins.

Even though bulk storage facilities exist, all transport of grain is in bags.[1)]

Warehouses owned by EGC are small, simple structures with corrugated sheet metal walls and roofs on a wooden frame of eucalyptus poles and concrete or stone slab floors. Similar type structures are being erected for the Extension and Project Implementation Department relief storage. Warehouses leased by EGC are of similar construction. Effective capacities for long term storage are about 70 percent of stated capacities.[1)]

From a survey conducted in 1971-72, the private warehouse capacity is estimated at approximately 340,000 M.T.[2)] and is located as follows:[2)]

Location	No. Units	Capacity
Addis Ababa	50	105,000 M.T.
Asmara	40	100,000 M.T.
Nazareth	80	80,000 M.T.
Other Country Marketing Centers (25-50 M.T. Size)		55,000 M.T.

Capacities and location of EGC, AMC and Relief storage facilities are shown in the accompanying tables and maps.

---

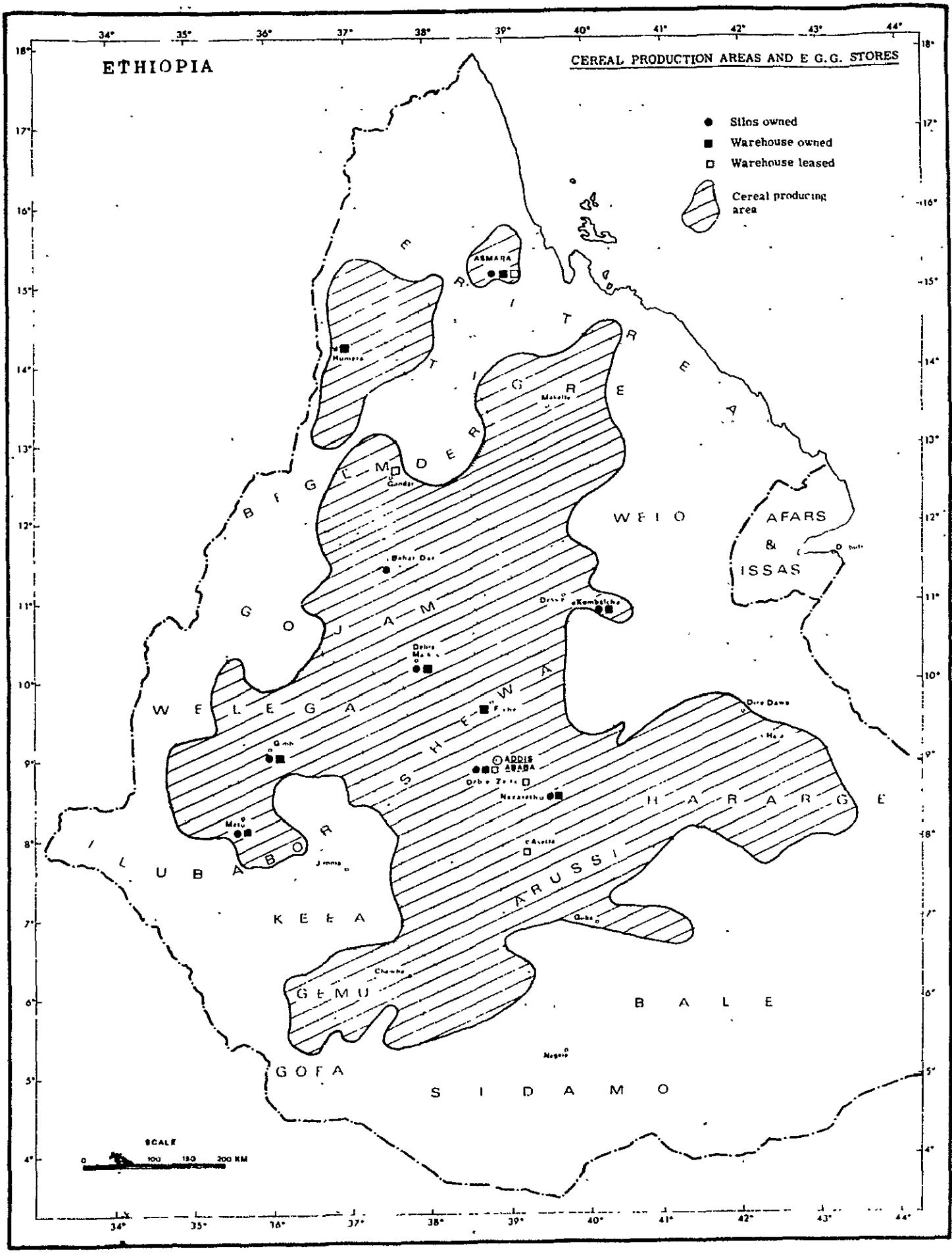
1) FAO (1974) A Policy and Action Plan for Strengthening National Food Security in Ethiopia. World Food Security-Country Report. ESC/FSP/ETH, November 1974.

2) Eubanks, K. (1973) Market Structure Study Related to Those Commodities That Provide the Basic Subsistence for the People of Ethiopia. Imperial Ethiopian Government.

EXISTING ETHIOPIAN GRAIN CORPORATION
STORAGE CAPACITIES

Locality	Type of Storage	Owned	Leased	Total
		(Metric Tons)		
Addis Ababa	Silos	20,000	--	29,000
	Warehouse	1,500	7,500	
Assella	Warehouse	--	1,000	1,000
Asmara	Silos	1,000	--	17,150
	Warehouse	150	16,000	
Bahar Dar	Silos	1,000	--	1,000
Kombolcha	Silos	1,000	--	1,500
	Warehouse	500	--	
Debre Zeit	Warehouse	--	1,500	1,500
Debre Narkos	Silos	2,000	--	2,500
	Warehouse	500	--	
Dire Dawa	Warehouse	--	1,000	1,000
Fiche	Warehouse	700	--	700
Gimbi	Silos	1,000	--	1,150
	Warehouse	150	--	
Gondar	Warehouse	--	1,000	1,000
Netu	Silos	1,000	--	1,150
	Warehouse	150	--	
Nazareth	Silos	2,000	--	3,500
	Warehouse	1,500	--	
Humera	Warehouse	300	--	300
Sub-totals:	Silos 29,000			
	Warehouse 5,450			
TOTALS:		34,450	28,000	62,450

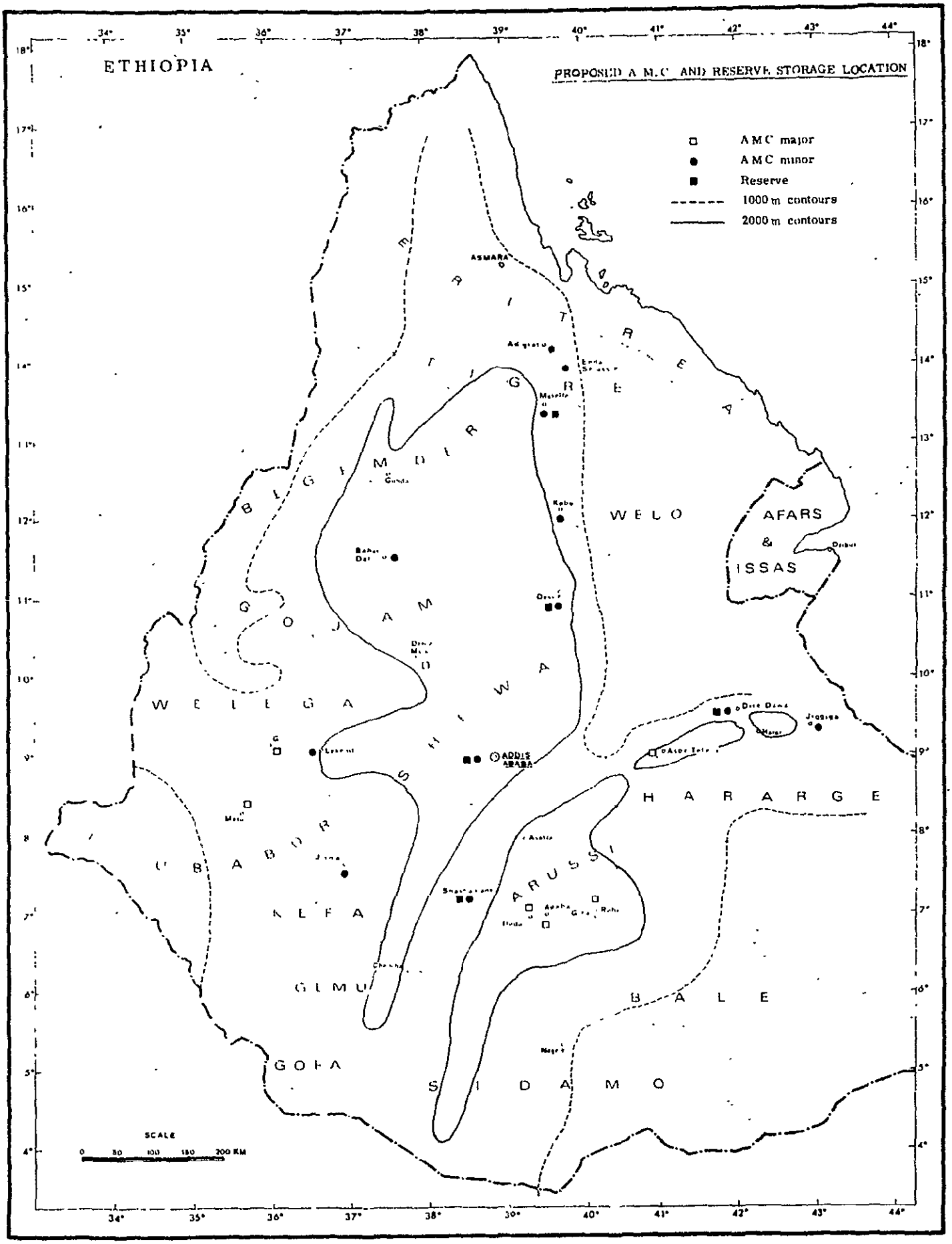
SOURCE: EGC, May 1974


ETHIOPIA
CEREAL PRODUCTION AREAS AND E G.G. STORES
Silos owned
Warehouse owned
Warehouse leased
Cereal producing area
ASMARA
Humera
Gondar
Mekelle
Bahar Dar
Kombolcha
Dessie
Debre Mark
Fiche
ADDIS ABABA
Debre Zeit
Nazareth
Dire Dawa
Harar
Metu
Jimma
Asella
Robe
Negele
Chemba
WELLO
AFARS & ISSAS
Dikhil
GOJAM
WELEGA
SHEWA
HARARGE
ILUBABOR
KEFA
ARUSSI
GEMU
BALE
GOFA
SIDAMO
SCALE
0 100 150 200 KM

ETHIOPIA
PROPOSED AGRICULTURAL MARKETING CORPORATION
AND RESERVE STORAGE LOCATIONS

Province	Location	AMC Stores	Reserve Stores
		(Metric Tons)	
Bale	Robi	600	--
	Adaba	600	--
	Dodolo	600	--
Tigre	Enda-Selassie	15,000	--
	Makelle	5,000	10,000
	Adigrat	5,000	--
Wollo	Dessie	7,500	10,000
	Kobo	5,000	--
Wollega	LeKempte	5,000	--
	Gimbi	2,000	--
Kefa	Jimma	5,000	--
Illubabor	Metu	2,000	--
Harrar	Jijiga	5,000	--
	Dire Dawa	5,000	10,000
	Asbe Terefi	600	--
Gojam	Dahar Dar	5,000	--
	Debre Markos	2,000	--
Shoa	Addis Ababa	20,000	15,000
	Shashamane	10,000	5,000
	TOTAL	100,900	50,000

SOURCE: FAO (1974) A Policy and Action Plan for Strengthening National Food Security in Ethiopia. World Food Security-Country Reports.


ETHIOPIA
PROPOSED A.M.C. AND RESERVE STORAGE LOCATION
AMC major
AMC minor
Reserve
1000 m contours
2000 m contours
ASMARA
Adigrat
Mekele
Gonder
Kobo
Bahar Dar
Dessie
Debre Mark
Debre Zeit
Lekemt
ADDIS ABABA
Mizan
Jimma
Shashamane
Asella
Arsi Negele
Robe
Chiche
Dire Dawa
Harar
Jijiga
Asebe Teferi
Dubti
Negele
WELO
AFARS & ISSAS
GOJAM
WELEGA
SHEWA
HARARGE
ILUBABOR
KEFA
ARUSSI
GIMU
BALE
GOFA
SIDAMO
SCALE
0 50 100 150 200 KM

GAMBIA

No data available on storage capacity in Gambia.

Paddy rice is stored on the farm either on the head (unthreshed) or threshed in bags in dwelling houses.

GHANA

Farm storage in Ghana is principally of three traditional types: 1) the "Ewe Barn," a raised circular platform on which cobs are built up to form a cylinder and covered with thatch, (2) the "Achanti Crib," a raised rectangular structure constructed of wood or bamboo and roofed with thatch, and (3) the "Pole Type Storage," whereby bunches of cobs are hung from horizontal poles.

Burnt brick, concrete or aluminum silos are used in larger towns, government-controlled agricultural organizations and large scale private farms. Aluminum silos of 10 to 250 M.T. capacity are most popular.

Warehouse storage of maize in bags is widely practiced also.

Large scale government bulk storage in the form of modern concrete silos has been promoted in the past 5 years. Eight major facilities were in various stages of completion in 1969 as indicated below:

LOCATION	CAPACITY	STAGE OF COMPLETION
Accra	10,000 M.T.	Near Complete
Kumasi	5,000	Contracted
Takoradi	5,000	Near Complete
Cape Coast	5,000	Platform Finished
Tamale	5,000	Platform Finished
Ho	5,000	Near Complete
Sunyani	5,000	Contracted
Wa	5,000/45,000 M.T.	Platform Finished

In addition another 100,000 M.T. capacity exists at Terna that could be used for grain.[1)]

More data on bulk and warehouse storage facilities in Ghana may be found in Africa Appendix 42, Entente States.

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1) AID (1969) "Grain Stabilization Study - The Entente States and Ghana" Economic and Engineering Study. Prepared by Weitz-Hettelsater Engineers, Inc.

IVORY COAST

No information is included here on farm storage. Data on bulk grain storage and warehouse storage is included in the "Entente States," Africa Appendix 42.

The "Grande Moulin de'Abidjan" located in Abidjan is privately owned and has a capacity of 30,000 M.T. Four major rice mills have a total of 20,200 M.T. capacity and government controlled warehouse a total of 18,000 M.T. capacity.[1)]

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1) AID (1969) "Grain Stabilization Study - The Entente States and Ghana" Economic and Engineering Study. Prepared by Weitz-Hettelsater Engineers, Inc.

KENYA

No information is presented here on small farm storage of grains.

On large farms, maize on the cob may be stored in cribs with open type construction to allow air ventilation for drying. A greater proportion of the maize is stored in bags. Standard bag storage facilities are of poor construction and condition. Large numbers of farms with some sort of grain silos for storing bulk grain do exist.[1)]

In addition to data in the accompanying table, the Maize and Produce Board in Kenya has constructed a total of 70 air-tight "Cyprus" bins; 40 at Kitale and 30 at Nakuru. A total capacity of 1,000,000 200-pound bags of corn (capacity 100,000 M.T.) as a long term strategic reserve can be accommodated in these bins.[2)]

The Maize and Produce Board in 1972/73 entered into contracts for the construction of five (5) new stores (two at Sagana, one each at Nairobi, Webuye and Moi's Bridge), and major redevelopment of the Nairobi depot. These new stores will provide additional storage capacity of 500,000 bags, giving a total maize capacity of about 4,000,000 bags.[3)]

Wheat storage capacity (1972-73) in Kenya is shown in Table 2. The total capacity of 1,107,500 x 90 Kilo Bags is equivalent to 99,675 M.T. Bulk storage capacity was 14,310 M.T.[4)]

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1) Latta, R. and N. Ives (1966) "A Plan for Mechanization of Grain Storage in Kenya." Prepared for AID by Associated Senior Consultants, Inc.

2) FAO, Commodities and Trade Division, 1974.

3) Personal communication, U.S. Agricultural Attaché, March 13, 1975 (Source: Maize and Produce Board, Nairobi Annual Report 1972/73.)

4) Personal communication, U.S. Agricultural Attaché, March 13, 1975 (Wheat Board, Annual Report 1972.

KENYA

TABLE 1. EXISTING MAIZE STORAGE FACILITIES

The Maize Marketing Board as of September 19, 1966 owned or leased stores having a capacity of 2,534,100 bags. The location, size, and type of these stores are indicated as follows:

1.	Owned by Maize Marketing Board		
	Nairobi	350,000	
	Mombasa	80,000	
	Kitale	125,000	
	Eldoret	220,000	
	Kipkarren	15,000	
	Hoey's Bridge	15,000	
	Milton Siding	13,000	
	Nakuru	25,000	
	Konza	85,000	
	Kibwezi	9,000	
	Airhouse, Nakuru	57,000	
			994,000
2.	Agency Stores		
	Nyanza and Western Provinces (Western Kenya Marketing Board) Kisumu, Muhoru Bay, Kendu Bay, Homa Bay, Kisii, Yala, Myanga, Bungoma, Broderick Falls, Butere, Kapsabet		664,500
	Central Province (Kenya Agricultural Produce Marketing Board) Thika, Segana, Karatina, Meru, Nanyuka, Nyeri		110,000
	Kibwezi (K.A.P.M.A.)		80,000
3.	Rental Stores		
	Long Term		
	Elburgon	17,000	
	Milton Siding	13,000	
	Rongai	23,000	
	Lugari	9,000	
	Thomson's Falls	18,000	
	Turbo	3,600	
	Thika	16,000	
			99,600
	Short Term		
	Nairobi	193,000	
	Mombasa	136,000	
	Nakuru	45,000	
	Naivasha	75,000	
	Rongai	7,000	
	Eldoret	10,000	
	Thika	140,000	
			606,000
	Total		2,534,100

Reference: Latta, R. and N. Ives (1966) "A Plan for Mechanization of Grain Storage in Kenya." Prepared for AID by Associated Senior Consultants, Inc.

TABLE 2. KENYA
WHEAT STORAGE - 1972/73

Name of Store		CAPACITY 90 Kilo Bags	Bulk	Totals
Wheat Board Store No. 1	Eldoret	99,000	18,000	
Government Store No. 2	Eldoret	42,000	--	
Hasham Lalji Store No. 3	Eldoret	120,000	--	279,000
Properties	Kitale	7,000	--	7,000
G. & R. Likoni Road	Nairobi	300,000	--	300,000
K. F. A. (Two Stores)	Njoro	16,000	--	16,000
Government Wheat Store	Naivasha	60,000	--	60,000
Government Wheat Store	Thomson's Falls	53,000	--	53,000
Government Wheat Store	Ol'Kalou	45,000	--	45,000
Wheat Board Store	Nakuru	125,000	35,000	160,000
Wheat Board Store	Narok	--	50,000	50,000
Wheat Board Store	Kiganjo	50,000	--	50,000
Wheat Board Store	Nanyuki	31,500	6,000	37,500
Wheat Board Store	Enengipire	--	50,000	50,000
		948,500	159,000	1,107,500
N.B.: Nakuru Wheat Board Silo in Operation During December, 1973.		-224,000		1,331,500

SOURCE: Wheat Board Annual Report, 1972/73.

LESOTHO

No data are presented here for farm or other grain storage capacities. Any bulk storage of grain for Lesotho would generally be handled in South Africa.[1)]

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1) Personal Communication, U.S. Agricultural Attaché, Pretoria, February 19, 1975.

LIBERIA

No data is presented here on farm storage. The Freeport in Monrovia has no facilities for handling bulk shipments of grain and the capacity of small flat warehouses is not known. The Mesu Feed Mill in Monrovia has only small storage. The Seaboard Allied elevator in Buchannan has a capacity of 7,500 M.T.[1)]

[1)] Personal communication, U.S. Agricultural Attaché, March 6, 1975.

MALI

No data is available on farm storage capacities or methods.

Data presented here reflects storage facilities operated and/or utilized by the government storage organization.

MALI: Warehouse Locations and Capacities in Use by OPAM

Location	Number	Operation	Individual Capacity (Metric Tons)	Total Capacity
Region of Kayes				
Kayes	1	OPAM	3,000	3,000
	1	Private	3,000	3,000
Throughout Region	10	Private	approx. 500	5,000
	11	SMDR	500 ea.	5,500
				16,500
Region of Bamako				
Bamako	1	OPAM	10,000	10,000
Koulikoro	1	OPAM	5,000	5,000
Nara	1	OPAM	1,000	1,000
Throughout Region	2	SMDR	500 ea.	1,000
	2	Private	approx. 500	1,000
				18,000
Region of Sikasso				
Bougouni	1	OPAM	4,000	4,000
Koutiala	1	OPAM	1,000	1,000
Sikasso	1	OPAM	1,000	1,000
Throughout Region	1	Private	approx. 500	500
	6	SMDR	500 ea.	3,000
				9,500
Region of Segou				
Macina	2	OPAM	1,000 ea.	2,000
Niono	1	OPAM	1,000	1,000
Tominian	1	OPAM	1,000	1,000
Segou	1	Private	3,000	3,000
Throughout Region	6	SMDR	500 ea.	3,000
	1	Private	500	500
				10,500
Region of Mopti				
Mopti	1	OPAM	4,000	4,000
Djenne	1	OPAM	1,000	1,000
Bankass	1	OPAM	1,000	1,000
Koro	1	OPAM	1,000	1,000
Throughout Region	2	SMDR	500 ea.	1,000
	3	Private	approx. 500 ea.	1,500
				9,500

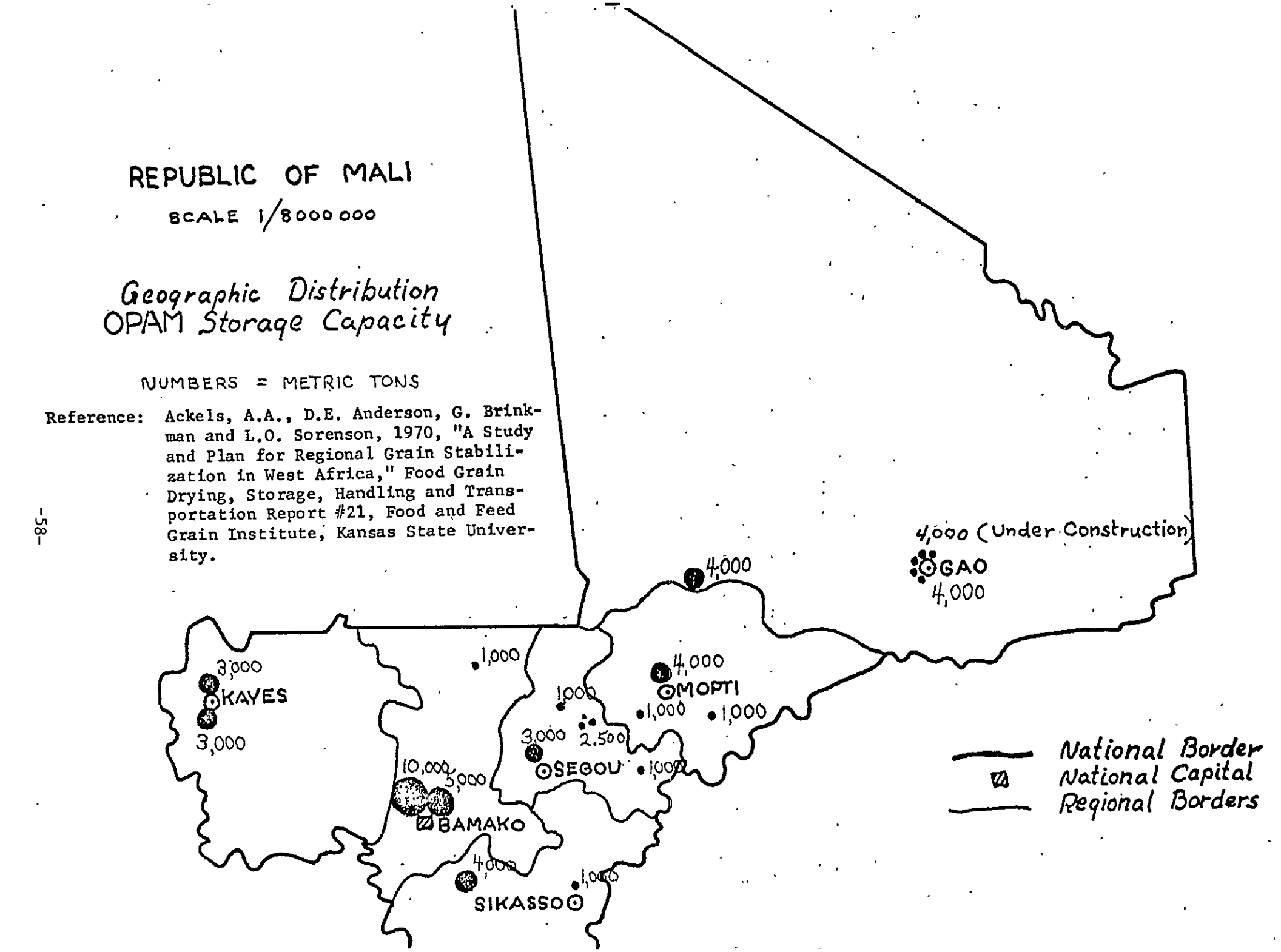
(continued next page)

Region of Gao				
Gao	5	OPAM	800 ea.	4,000
Dire	1	OPAM	4,000	4,000
Throughout Region	3	SMDR	500 ea.	1,500
	32	Private	approx. 500 ea.	16,000
Under Construction	2	OPAM	2,000 ea.	4,000
				29,500
Total for Country	23	OPAM	1,000-10,000	48,000
	30	SMDR	500	15,000
	2	Private	3,000	6,000
	49		est. 500	24,500
				93,500

abbreviations:

OPAM = Office of Agricultural Products of Mali

Reference: Ackels, A.A., D.E. Anderson, G. Brinkman and L.O. Sorenson, (1970), "A Study and Plan for Regional Grain Stabilization in West Africa," Food Grain Drying, Storage, Handling and Transportation Report No. 21, Food and Feed Grain Institute, Kansas State University.



Reference: Ackels, A.A., D.E. Anderson, G. Brinkman and L.O. Sorenson, 1970, "A Study and Plan for Regional Grain Stabilization in West Africa," Food Grain Drying, Storage, Handling and Transportation Report #21, Food and Feed Grain Institute, Kansas State University.

NIGER

Many of the facilities in Niger are small capacity village level structures left over from the colonial system which has a "forced storage system." After independence, farmers went back to traditional on-farm storage. No data or information is presented here on farm storage.

Data on bulk storage and warehouse capacities are included in Africa Appendix 42 Entente States.

NIGERIA

Except for small quantities stored by the Government agencies as famine reserves, most of the production is stored by farmers and traders.

The Nigerian Stored Products Research Institute is probably one of the most active national organizations promoting improved grain storage in Africa. The Institute for Agricultural Research at Samaru (closely associated with Ahmadu Bello University) has concentrated on improved methods of farm storage, especially for northern Nigeria. Current work deals with modification of flask-shaped mud structures with thatched roofs and capacities of 100 to 1,000 pounds. Sorghum is stored in the head in these "rumbu" and cowpeas in the pod. Structurally, they cannot withstand pressures of bulk grain if filled completely. Some farmers are said to have as many as 20 "rumbu" outside the home.

Traditionally small quantities of maize are stored in overhead areas of dwellings in the Western State of Nigeria. A cooperative experiment in this area initiated with two 20-ton capacity aluminum silos has grown to a present fifteen silos with 2,400 M.T. capacity (1971). There are proposals to build 15 more silos for corn and 11 for rice in the future.[1)]

Although there is no detailed information available on grain storage facility capacity in Nigeria, it is estimated that the State Governments have a combined capacity of 90,000 M.T. Data is not available on individual State storage capacities.

The Federal Military Government has indicated that it plans to expand grain storage facilities to 250,000 M.T. during the Development Plan, 1975-80.

Private grain storage facilities, owned by wheat millers, are estimated at 59,000 M.T. and located as follows:[2)]

Location	Capacity
Lagos	22,000 M.T.
Sapele	15,000
Port Harcourt	16,000
Calabar	6,000

Groundnuts are stored in large pyramids each consisting of approximately 1,000 tons in bags. At Kano there are depots storing groundnuts in about 100 pyramids.[3)]

---

1) Williams, S.K.T. (1973) Grain Storage in the Western State of Nigeria. Trop. Stor. Prod. Info. No. 25.

2) Personal communication, U.S. Agricultural Attaché, February 18, 1975.

3) Krishnamurthy, K. (1971) Improvement of Storage of Food Grains and Commercial Crops in Nigeria. Bull. Grain Tech. 9(1):40-45.

SENEGAL

Small mud huts are the common type of storage facility in the countryside. Two mills in Senegal have storage capacities as follows:[1)]

Les Grands Moulins de Dakar	about 12,000 M.T.
Moulins Sentinac	less than 5,000 M.T.

1) Personal communication, U.S. Agricultural Attaché, March 6, 1975.

SIERRA LEONE

No data is presented here on capacity of farm or government storage in Sierra Leone. A commercial milling company is reported to have an elevator with capacity of 7,500 metric tons bulk storage.[1)]

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1) Personal communication, U. S. Agricultural Attaché, (Liberia) March 6, 1975.

SOMALIA

Grain sorghum and maize are the principal grain crops. Approximately 50 percent of the production is estimated to be stored on farms. In the southern area almost all farm and some merchant storage is in underground pits. Some grain is stored in bags also, bag stored being the only means where underground storage is not suitable. Farm pits usually hold between 5 and 25 M.T. while those of merchants may have 100 M.T. capacity. [1)]

In 1964 an FAO report indicated that government grain storage facilities consisting of upright concrete, masonry and metal silos totalling 2,100 M.T. existed at seven locations and 2,400 M.T. sack storage capacity existed at four locations. None of the government storage facilities were in use and had not been used since 1958. No agency had taken up grain storage, management or maintenance and facilities are slowly deteriorating. Type and location of storage facilities are shown in the accompanying tables.[2)]

---

1) Watt, M. J. (1969) Grain Storage and Marketing in the Somali Republic. Trop. Stor. Prod. Info. 18, 1969.

2) FAO (1964) Report on the Government of Somali "Grain Silos". FAO Report No. 1905, Rome.

LOCATION AND CAPACITY OF THE EXISTING GRAIN STORAGE FACILITIES

Existing Grain Stores			Storage Capacity (tons)		
Location	No	Type	In Bulk	In Sack	Total
Jamama	3	Batteries of up-right Concrete bins	900	300	1,200
Afgoi	3	Batteries of up-right Concrete bins	900	300	1,200
Baidoa	1	Masonry warehouse	-	1,200	1,200
Baidoa District	20	Steel bins	90	-	90
Genale	1	Bolted steel tank	100	-	100
Belet Uen	1	Masonry warehouse	-	600	600
Balad	2	Up-right concrete silos	40	-	40
Marreire	2	Up-right concrete silos	40	-	40
Borama	1	Masonry silo	30	-	30
TOTAL			2,100	2,400	4,500

GEOGRAPHICAL DISTRIBUTION OF GRAIN
PRODUCTION AREAS AND STORAGE FACILITIES

REGIONS	Grain Production		Storage Capacity of The Existing Silos	
	Tons	%	Tons	%
Central uplands - Baidoa Plain	98,000	48	1,290	29
Scebeli Flood Plain and Coastal Dune	46,000	22	1,380	31
Bur Region and Alluviated Plains	21,000	10	-	-
Hargeisa and Borama Districts	25,000	12	30	-
Lower Giuba	13,000	7	1,200	27
Upper Scebeli and Giuba Valleys	2,000	1	600	13
TOTAL	205,000	100	4,500	100

REPUBLIC OF SOUTH AFRICA

No data is presented here for farm or village-level grain storage.

The government of the Republic of South Africa began making loans available for construction of grain silos as early as 1952. Initial rate of construction was very slow and up to 1965, only 1,284,000 tons capacity had been erected. As a result of the change-over to combine-harvesting of maize, the "Maize Board" requested increased government loans to cooperatives for new storage. From time to time the government has also made loans available to millers and agents other than cooperatives. As a result of increased government loan funds, bulk grain storage in 1974 has nearly doubled since 1970. Government loans accounted for 68.7 percent of new construction with 31.3 percent financed from other sources.[1)]

Although information presented in the table on the following page covers only about half of the Republic of South Africa, bulk storage facilities not mentioned here would be considered insignificant (see map, page 59).[2)]

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1) MAIZE BOARD (1974) Report on Maize for the Financial year ended 30 April 1974. Pretoria: Maize Board, 48 p.

2) Personal Communication, U. S. Agricultural Attaché, February 19, 1975.

REPUBLIC OF SOUTH AFRICA

STORAGE SPACE AVAILABLE FOR GRAIN IN 1969/70 TO 1973/74 MARKETING SEASONS

('000 tons)

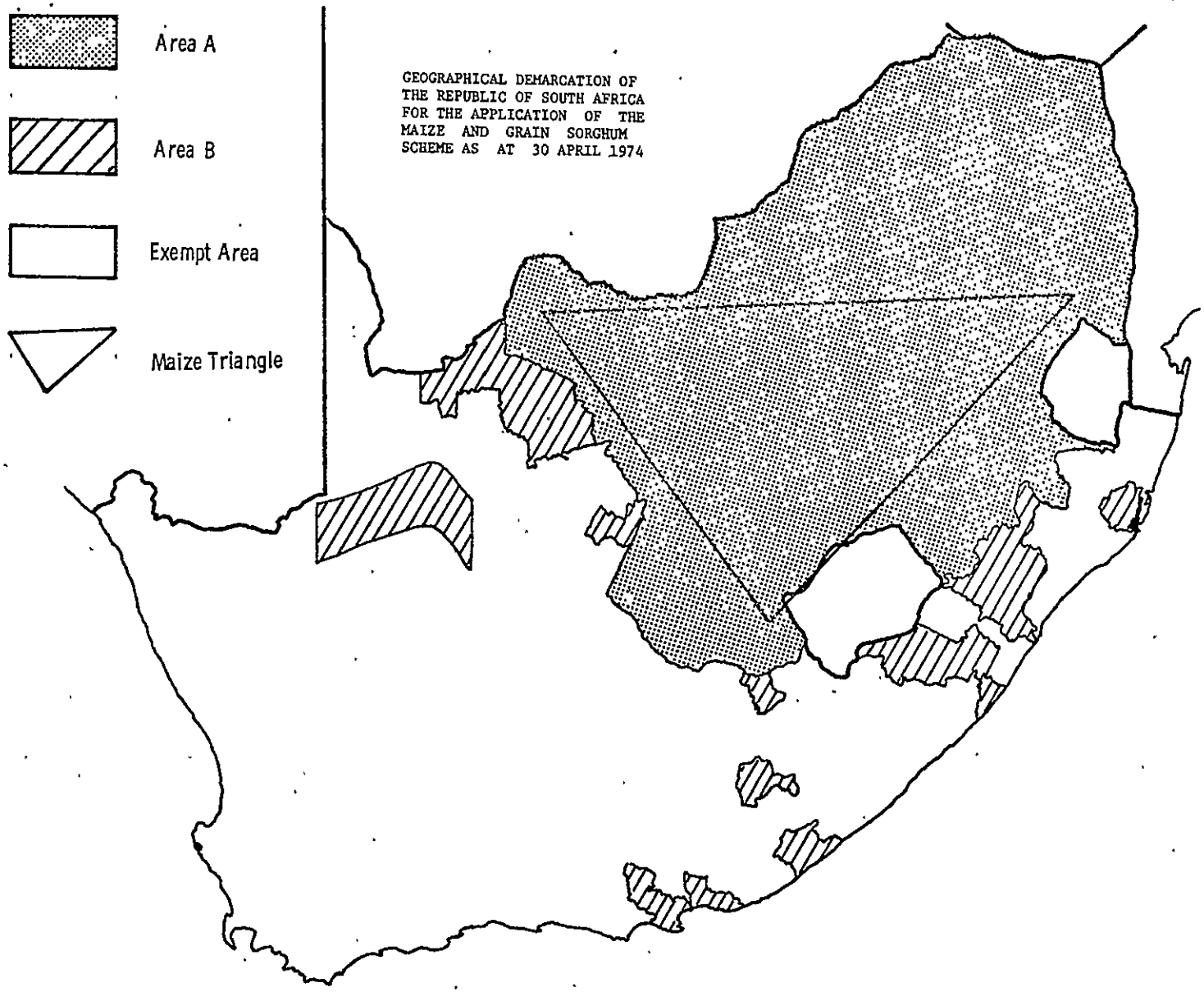
Type of grain handler	1969/70				1970/71				1971 72				1972 73				1973 74			
	Bag stores	Grain silos	Total	Per-centage of total	Bag stores	Grain silos	Total	Per-centage of total	Bag stores	Grain silos	Total	Per-centage of total	Bag stores	Grain silos	Total	Per-centage of total	Bag stores	Grain silos	Total	Per-centage of total
Co-operative agents in Area "A" only	3 485	2 417	5 902	85,66	3 496	2 991	6 487	85,31	3 210	3 665	6 875	86,38	3 343	4 306	7 649	88,13	2 949	5 099	8 048	88,50
Miller agents in Area "A" only	492	176	668	9,69	600	179	779	10,24	604	210	814	10,23	567	1 [a]	733	8,45	567	202	769	8,46
Trader agents in Area "A" only	106	62	168	2,44	77	109	186	2,45	73	123	196	2,46	66	143	209	2,41	62	143	205	2,25
Group "B" grain silos [b]	-	152	152	2,21	-	152	152	2,00	-	79	79	0,93	-	79	88	1,01	-	72	72	0,79
Total for agents	4 083	2 807	6 890	100,00	4 173	3 431	7 604	100,00	3 887	4 077	7 964	100,00	3 976	4 694	8 679	100,00	3 578	5 516	9 094	100,00
Commercial millers (non-agents) and other processors [c]	284	209	493		303	232	535		301	242	543		367	316	683		298	331	629	
Grand total	4 367	3 016	7 383		4 476	3 663	8 139		4 188	4 319	8 507		4 343	5 010	9 362		3 876	5 847	9 723	

a) Storage space of co-operative mills now indicated under that of co-operative agents.

b) When a Group "B" grain silo is extended, it is reclassified as a Group "A" grain silo and included in co-operative agents.

c) Storage space for maize only.

REPUBLIC OF SOUTH AFRICA


Area A
Area B
Exempt Area
Maize Triangle
GEOGRAPHICAL DEMARCATION OF THE REPUBLIC OF SOUTH AFRICA FOR THE APPLICATION OF THE MAIZE AND GRAIN SORGHUM SCHEME AS AT 30 APRIL 1974

SWAZILAND

No data are presented here on farm or other grain storage capacities. Any bulk storage of grain for Swaziland would generally be handled in South Africa.[1)]

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1) Personal Communication, U.S. Agricultural Attaché, Pretoria, February 19, 1975.

TANZANIA

A recent study[1] of traditional storage structures in the Iringa Region indicated that 24 percent had capacities ranging from 0-9 bags (90 Kg each) and 71 percent had capacities of 10-21 bags. Data was based on a small sample survey.

Most of the bulk storage of crops in Tanzania is presently being handled by the National Milling Corporation (NMC). Products handled are mainly grains and seed-beans. These products are primarily stored in godowns and in cases where storage facilities are inadequate, the produce is stored in movable tailored plastics. The total storage capacity of NMC is approximately 207,700 metric tons and is distributed as shown in the accompanying table.[1]

---

[1] Mphuru, A. N., M. A. M. Maro and L. A. Odero-Ogwel (1974) Traditional Storage of Food Grains in Tanzania - With particular reference to The Storage of Maize in Iringa and Morogoro Regions. University of Dar es Salaam, Faculty of Agriculture and Forestry, Morogora, August 1974. 57 pg.

Tanzania

NATIONAL MILLING CORPORATION
STORAGE CAPACITY

Location	Capacity (in metric Tons)
Dar es Salaam	52,000
Mtwara	50,000
Iringa/Mikumi	116,300
Arusha	18,000
Dodoma	24,000
Moshi	14,500
Mwanza	4,500
Mpanda	9,000
Musoma	5,500
Manyoni	4,500
Tanga	5,500
Singida	4,500
Total	207,700

SOURCE: Daily News, Tanzania 29th September, 1973.

1) Mphuru, A. N., M. A. M. Maro and L. A. Odero-Ogwel (1974) Traditional Storage of Food Grains in Tanzania - With particular reference to The Storage of Maize in Iringa and Morogoro Regions. University of Dar es Salaam, Faculty of Agriculture and Forestry, Morogora, August 1974. 57 pg.

TOGO

No information is presented here on farm storage.

One metal silo is located at Lama-Kara and has 50 M.T. capacity operated by SORAD, plus 10,000 M.T. warehouse capacity at Lome.

Plans to construct 10 small warehouses (150 M.T. capacity each) in the Savanna district in central and northern Togo were in process in 1969.

See Africa Appendix 42, Entente States.

UPPER VOLTA

Many of the facilities indicated on the following pages for Upper Volta are small capacity, village level structures left over from the Central Colonial system which required a "forced storage system." After independence, farmers reverted to storing grain in their own facilities. The facilities have been unused and are reported to be in various stages of disrepair.[1)]

Data on bulk storage capacities included in the accompanying table is also included in the "Entente States" section, Africa Appendix 42 .

---

1) AID (1969) "Grain Stabilization Study - The Entente States and Ghana" Economic and Engineering Study Prepared by Weitz-Hettelsater Engineers, Inc.

UPPER VOLTA

INVENTORY OF STORAGE SPACE FOR CEREALS

Location	Type of Storage	Capacity of Storage In Metric Tons
BOROMO	1 Silo	70.000
DORI	40 Silos	245.000
(Subdivision Sebba)	1 Silo	12.000
KOUDOUGOU (Subd. Centrale)	1 Silo	65.000
	1 Warehouse	979.200
KOUDOUGOU (Commune)	1 Warehouse	485.600
Subd. Nanore	3 Warehouses	100.000
" Kindi	1 Warehouse	20.000
" Kokologo	1 Silo	65.000
" Savou	--	--
ZORGHO	7 Silos	177.000
	2 Warehouses	100.000
LEO	1 Warehouse	50.000
Subd. FARA		
HOUNDE	1 Warehouse	100.000
TITAO	1 Silo	60.000
DIAPAGA	9 Silos	126.000
ZABRE	8 Silos	136.000
KONGOUSSI	3 Silos	210.000
TOMA	1 Warehouse	395.000
MANGA	4 Silos	63.750
	1 Silo	8.500
	6 Silos	89.250
BOGANDE	2 Warehouses	150.000
	21 Silos	196.000
KOMBISSIRI	2 Warehouses	42.500
	9 Silos	204.000
	1 Silo	34.000
	3 Silos	25.500
BANFORA	5 Warehouses	552.500
	6 Silos	408.000
	1 Covered Dock	573.750
	4 Warehouses	552.500
PO	2 Warehouses	80.000
OUDALAN	13 Silos	115.000
PISSILA	1 Silo	66.000
GARANGO	1 Silo	90.000
KOUPELA	1 Silo	190.400
	1 Covered Dock	51.000

-Table Continued

GOURCY	1 Covered Dock	400.000
	1 Silo	60.000
SAPONE	9 Silos	219.000
FADA N'GOURMA	19 Silos	205.000
	4 Warehouses	250.000
Subd. Cominyanga	2 Silos	40.000
" Pama	3 Silos	60.000
Poste Adm. Djibasso	9 Silos	32.000
DJIBO	1 Silo	80.000
Subd. Aribinda	---	--
YAKO	1 Silo	60.000
Subd. Samba	1 Silo	50.000
NOUNA	2 Silos	160.000
ZINIARE	7 Silos	199.000
BOUSSE	10 Silos	151.000
BOBO-DIOULASSO	3 Silos	765.000
Subd. Toussiana	1 Warehouse	425.000
BARSALOGO	1 Silo	59.500
TENKODOGO	3 Silos	250.000
	1 Warehouse	250.000
	1 Silo	42.501
SOLENZO	1 Warehouse	94.350
DIEBOUGOU	1 Warehouse	60.000
DEDOUGOU	1 Silo	125.000
Subd. Safare	4 Granaries	60.000
	1 Warehouse	471.750
	1 Silo	28.000
Commune Ouagadougou	1 Warehouse	119.200
	4 Covered Docks	976.650
OUAHIGOUYA	1 Silo	60.000
Subd. Centrale	1 Silo	80.000
	1 Silo	80.000
O. R. D.	3 Warehouses	--
Subd. THIOU	1 Silo	--
" Koumbri	1 Warehouse	87.550
TOUGAN	2 Silos	160.000
	1 Warehouse	5.000
Subd. Kienbara	---	--
GAOUA	1 Silo	40.000
	1 Warehouse	60.000
Subd. Nako	--	--
" KAMPTI	--	--
THIEBELE	1 Warehouse	75.000

- Table Continued

KAYA	1 Silo	60.000
	2 Warehouses	40.000
	4 Granaries	20.000
	1 Granaries	--
Subd. Boussouma	1 Silo	60.000
" Toma	1 Silo	30.000
	1 Warehouse	20.000
Subd. Korsimogo	2 Silos	25.000
" Mane	1 Silo	10.000
ORODARA (Cercle)		
Subd. N'Dorola	2 Warehouses	204.000
		138.000
R E O	1 Silo	80.000
Subd. Didyr	--	--
BOULSA	3 Warehouses	163.200
	1 Silo	68.000
Subd. Tougouri	1 Silo	59.500
	1 Warehouse	42.500
	1 Warehouse	76.500
SEGUENEGA	2 Silos (metal)	
	1 at Bema	70.000
	1 at Seguenega	10.000
TENADO	1 Silo at Pouni	--
Cercle OUAGADOUGOU	1 Silo at Zagtouli	25.000
	1 Silo at Saba	25.000
	1 Silo at Douloulma	20.000
	1 Silo at Tanghin	20.000
	1 Silo at Bazoule	20.000
	1 Silo at Komki	20.000
	Cercle	25.000
	Ouaga	--
	1 Warehouse	--
	GRAND TOTAL	15,115.651

Upper Volta - The total of approximately 15,000 MT of storage capacity is available throughout the country in some 299 existing structures of unknown quality.

Reference: Ackels, A.A., Anderson, D.E., Brinkman, G. & Sorenson, L.O., 1970, "A Study and Plan for Regional Grain Stabilization in West Africa." Food Grain Drying, Storage, Handling and Transportation, Report No. 21, Food and Feed Grain Institute, Kansas State University.

ZAIRE

No data are available on total capacity of producer storage. Producers commonly store quantities of maize they will need for food and seed in the ear on rafters in their homes over the cooking area. Maize to be sold in the market, to dealers or the government is left in the field on stalks or stored on thatch-covered platforms near the field until it is sold. Maize grain and peanuts may be stored in baskets either suspended inside or outside of the huts.[1) 3)]

Prior to independence in 1960, large enterprises were said to have storage facilities on plantations, at factories and at transfer points along transport routes.[1)] Some of these facilities still exist and are still in use, however, there is no accurate estimate of such storage.[3)] Many of the facilities have been taken over by the government and at present, storage functions seem to be distributed among several agencies.

A National Office of Cereals (ONACER) was established in 1974, however, this organization owns or controls facilities for only small quantities of storage at present. It has been recommended that ONACER establish ten grain collection stations with warehouse sack storage capacity of 20,000 M.T. total in 1976 with expansion to 100,000 M.T. by 1985.[3)] These collection stations would serve to move grain from producer areas to consuming and processing centers in Kinshasa, Lubumbashi, and other consumption centers.

Some bulk storage for grain does exist at a few locations in Zaire. Rough estimates indicate the following bulk storage capacities:[2)3)]

Location	Facility	Capacity
Matadi	Midema Flour Mill	14,000 M.T.
Kinshasa	OZAC	15,000 M.T.
Likasi	Gecamine Mills	(est.) 6,000 M.T.

Reference: 1) Drachoussoff, V. (1965) "Agricultural Changes in the Belgian Congo: 1945-1960." Stanford University Food Research Institute Studies Vol. 2.

2) Personal Communications, U. S. Agricultural Attache, February 7, 1975.

3) Sorenson, L.O., J. R. Pedersen and N.C. Ives (1975) Maize Marketing in Zaire. Grain Storage, Processing and Marketing Report No. 51. Food and Feed Grain Institute, Kansas State University, July 1975.

ZAMBIA

Since 1967, a variety of grain storage facilities have been constructed in Zambia. There are four methods of grain storage in Zambia - (1) Bulk - in silos; (2) Bag - in covered sheds; (3) Bag - in sheds with roofs, no sides; and (4) Bag - on hardstandings under P. V. C. tarps.

Total storage capacity, excluding sheds which have been taken over by fertilizer, stood at 7,735,500 bags as of October 1974.

The accompanying table indicates types, capacities and location of storage facilities added since 1967.

In addition to storage indicated above, two 250 bag capacity silos were to be completed July 31, 1973 but as of October 1974, the National Agricultural Marketing Board had not accepted them.[1)]

[1)] Personal communication, U.S. Agricultural Attaché, Nairobi, March 13, 1975.

ZAMBIA: GRAIN STORAGE CAPACITY

Location	Capacity in Bags	Location	Capacity in Bags
Lusaka	1,000,000[a] 600,000[f]	Chipongwe	50,000[c]
Bwana Mkubwa	200,000[b]	Mkushi	120,000[d]
Senkobo	20,000[c]	Mansa	100,000[e]
Mayoba	20,000[c]	Mongu	50,000[e]
Bowood	30,000[c]	Chisamba	192,000[f]
Kalomo	50,000[c]	Choma	326,000[f]
Taka	50,000[c]	Chambeshi	600,000[f]
Tambero	20,000[c]	Kaleya	100,000[f]
Lumbombo	107,000[c]	Pemba	75,000[f]
Nega-Nega	40,000[c]	Karubwe	305,000[f]
Kabwe	345,000[c]	Natuseko	300,000[f]
Kasavasa	150,000[c] 100,000[f]	Kapiri Mpushi	358,000[f]
Chankwakwa	50,000[c]	Livingstone	276,000[f]
Kakulo	transit[c]	Monze	255,000[f]
TOTAL CAPACITY	5,889,000 bags		

---

a) Outspan barn added 1964-67.

b) One closed shed and one outspan barn added 1964-67.

c) Seasonal depots added 1968.

d) Block standing added 1970.

e) Undetermined type added in 1971.

f) Depots added 1972.

SOURCE: National Agricultural Marketing Board, October 1974.

ENTENTE STATES

Data included here represent bulk storage facilities and warehouse capacities for Chad, Dahomey, Ivory Coast, Niger, Togo, Upper Volta and Ghana.

For additional information on storage in these countries see the Africa Appendix for each country.

EXISTING GRAIN STORAGE FACILITIES IN THE ENTENTE STATES AND GHANA, 1968

Location	Number	Capacity (Metric tons)
DAHOMEY		
Cotonou	10	1,160
Parakou	5	580
Sekou	4	520
TOTAL	19	2,260
IVORY COAST		
Bouake		5,200
Gognoa		5,500
Korhogo		3,500
Man		6,000
TOTAL		20,200
NIGER		
Agadez	3	450
Bagga	2	112
Bamana	2	112
Bande	1	56
Belande	1	56
Bilma	1	160
Bohanga	1	56
Bolsi	1	56
Bonkoukou	2	112
Botou	1	56
Boubou	1	56
Bouza	2	112
Danmandou	1	56
Dargol	1	50
Difia	1	50
Dokimana	1	56
Dosso	1	50
Dosso	38	180
Dougucraoua	1	56
Doutchi	1	60
Fabidji	1	56
Fakara	1	56
Falmey	1	56
Fameli	2	7
Filingue	1	155
Filingue	1	20
Filingue	1	56
Galma	1	56
Gazaoua	1	56
Gotheve	1	50
Goudoumaria	1	56
Goure	2	200
Gueladio	1	56
Hamdalaye	1	56
Kanche	1	56
Karma	1	56
Keita	3	168
Kirtachi	1	56
Kollo	1	56
Konni	1	150
Korkoro	1	50
Koure	1	56
Lamorde	1	56
Libore	1	56
Louherou	1	56
Madaoua	1	56
Magaria	1	56
Maine-Soroa	1	56
Makalondi	1	56
Matameye	1	500
Mayaki	1	56
Mehana	1	50
Moggaem	1	56
Namaro	1	56
N'Dounga	2	112
Niamey	1	1,000
Ouallam	1	50
Ouallam	2	7
Ourno	1	56
Saga	1	56
Sansane Hooussa	4	14
Sansane Hooussa	1	50
Sassoumbroubroum	1	56
Sirfikoyara	1	50
Tabla	2	112
Tahoua	1	56
Tama	1	56
Tamou	1	56
Tanout	3	250

Table Continued-

Location	Number	Capacity (Metric tons)
Tillaberry	4	160
Tillaberry	6	21
Torodi	1	56
Wanzerbe	1	50
Zinder	2	300
TOTAL	138	7,214
TOGO		
Lama-Kara	1	50
UPPER VOLTA		
Banfora	6	480
Barsalogo	1	40
Bobo-Dioulasso	2	160
Bogande	21	196
Boromo	1	70
Boulsa	4	180
Bousse	10	215
Boussoomr	1	60
Dedougou	1	125
Diapaga	9	126
Diebougou	1	60
Djibo	1	80
Dori	40	245
Fada (Cominyangu)	2	40
Fada (Djibasso)	9	32
Fada N'Gourma	19	205
Fada (Pama)	3	60
Gaova	1	40
Garango	1	90
Gourcy	1	60
Kaya	1	60
Kokologo	1	65
Kombissiri	13	280
Kongoussi	3	210
Korsimogo	2	25
Koudougou	1	65
Koupela	1	100
Mane	1	10
Manga	10	80
Nouna	2	160
Ouagadougou	7	155
Ouagadougou (city)	3	195
Ouahigouya	3	220
Oudalan	13	115
Pissila	1	66
Sapone	9	219
Sebba	1	12
Seguenega	2	70
Toma	1	30
Tougan	2	160
Yako	1	60
Zabre	8	80
Zodio	1	60
Zurgho	7	70
TOTAL	225	4,936
GHANA		
Accra	20	10,000
Cape Coast	10	5,000
Ho	10	5,000
Takoradi	10	5,000
Tema (flour mill)		15,000
Tema (cocoa)		100,000
Tomale	10	5,000
Wa	10	5,000
TOTAL	70	150,000
TOTAL ENTENTE STATES		34,460
TOTAL Ghana		150,000
TOTAL		184,460

Note: Abidjan, Ivory Coast, has a 30,000 metric ton silo privately owned.

REFERENCE: A.I.D. (1969) "Grain Stabilization Study - The Entente States and Ghana" Economic and Engineering Study Prepared by Weitz-Hettelsater Engineers, Inc.

EXISTING WAREHOUSES IN THE ENTENTE STATES

Department	Ownership	Capacity
		(Metric tons)
Dahomey		
Cotonou	OCAD	1,000
Parakou	"	1,000
Sekou Exp. Sta.	"	1,000
Total		3,000
Ivory Coast		
Daoukro	SATMACI (Flat Warehouse)	1,800
Dimbokro	" " "	1,800
Duckuni	" " "	1,800
Duekoue	" " "	1,800
M'Bahiakro	" " "	1,800
Odienne	" " "	1,800
Prikro	" " "	1,800
Sinfra	" " "	1,800
Touba	" " "	1,800
Vavoua	" " "	1,800
Total		18,000
Niger		
Niamey	COPRO-NIGER	640
Togo		
Lome (Old Port Warehouse)	SORAD	10,000
Upper Volta		
Bobo-Dioulasso	SOVOLCOM	500
Ouagadougou	"	2,000
Total		2,500
TOTAL ENTENTE STATES		34,140

REFERENCE: A.I.D. 1969 "Grain Stabilization Study - The Entente States and Ghana" Economic and Engineering Study Prepared by Weitz-Hettelsater Engineers, Inc.

SAHELIAN COUNTRIES

TRANSPORT, STORAGE AND DISTRIBUTION CAPACITY IN THE COUNTRIES

Country	Monthly inland transport capacity	Observations	Existing storage facilities (in tons)	Under construction	To be provided
UPPER VOLTA	7 000/ 8 000 t	Could be increased if hauliers of neighbouring countries were authorized to deliver to final destination	19 600	15 000	30 000
MALI	Little information but highly inadequate	15 lorries requested for 6th region	96 000	-	-
MAURITANIA	11 000 t	Provided 44 10-ton lorries are supplied	very limited	-	40 000
NIGER	15 000 t	Could be doubled if Niger hauliers are authorized to operate in the country 30 lorries requested by Government of Niger	4 500	12 500	40 000
SENEGAL	No major problems; however, the lack of cross-country vehicles creates difficulties in distribution to villages		very limited in the interior	-	20 000
CHAD	3.000 t	Will be increased to 5 500 tons when the 100 Italian lorries arrive (in 74); the Government requests 13 cross-country lorries.	25 000	-	6 750

REFERENCE: "Chad", from Summary Report of the Multi-donor Mission to Assess the Food AID Necessary in 1973-74 Drought-stricken Sahelian Countries (Chad, Mali, Mauritania, Niger, Senegal and Upper Volta) FAO Conference Seventeenth session, Rome, November, 1973.

ASIA APPENDIX

Appendix Number		Page Number
1	Burma - No Data	-
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6	Malaysia/Singapore	105
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ASIA Appendix 3

INDONESIA

Data presented here is probably the most recent and reliable data on off-farm storage in Indonesia.

EXISTING WAREHOUSE AND GODOWN STORAGE, BY PROVINCE
INDONESIA, 1971

Province	Warehouses As Reported By BULOG, July 1, 1971					
	Owned By BULOG		Others		Total	
	Quantity	Capacity	Quantity	Capacity	Quantity	Capacity
	a/	a/ b/	a/	a/ b/	a/	a/ b/
					(1,000 tons of gabah)	
Atjeh	4	2.4	7	3.9	11	6.3
North Sumatra	2	13.1	9	15.0	11	28.1
West Sumatra	-	-	15	9.3	15	9.3
Riau	-	-	10	11.7	10	11.7
Djambi	-	-	6	5.3	6	5.3
South Sumatra	-	-	26	26.2	26	26.2
Lampung	4	3.9	1	2.6	5	6.5
Djakarta	2	9.7	44	144.4	46	154.1
West Java	1	0.5	75	106.5	76	107.0
Central Java	5	6.4	42	75.9	47	82.3
Jogjakarta	-	-	4	6.4	4	6.4
East Java	1	4.2	38	109.1	39	113.3
West Kalimantan	-	-	12	11.9	12	11.9
Central Kalimantan	-	-	-	-	-	-
East Kalimantan	1	0.4	13	10.6	14	11.0
South Kalimantan	-	-	18	8.1	18	8.1
South Sulawesi	60	47.6	3	7.1	63	54.7
Bali	-	-	4	2.3	4	2.3
West Nusa Tenggara	2	1.0	6	1.4	8	2.4
Other Provinces						
Bengkulu	-	-	-	-	-	-
North Sulawesi	3	6.0	11	32.2	14	38.2
Central Sulawesi	-	-	3	2.6	3	2.6
South-East Sulawesi	-	-	3	3.0	3	3.0
East Nusa Tenggara	-	-	4	3.8	4	3.8
Maluku	1	0.6	10	4.6	11	5.2
West Irian	-	-	21	33.4	21	33.4
INDONESIA	86	95.8	385	637.3	471	733.1

a/ Data from BULOG records, July 1, 1971.

b/ Data converted from rice to gabah. Density of gabah is 75 percent the density of rice.

Table Continued-

Province	Estimated Additional Existing Storage: Rice Mill Storage	Huller Storage	Godown And Retail Storage	Total	Total Existing Storage 1971
	c/	d/	e/		
Atjeh	7.8	3.6	9.1	20.5	26.8
North Sumatra	0.8	18.1	26.3	45.2	73.3
West Sumatra	3.2	10.5	11.2	24.9	34.2
Riau	0.2	0.5	6.2	6.9	18.6
Djambi	0.2	2.5	4.1	6.8	12.1
South Sumatra	3.6	14.9	13.8	32.3	58.5
Lampung	8.5	5.9	8.4	22.8	29.3
Djakarta	0.1	0.2	67.2	67.5	221.6
West Java	197.1	12.9	71.1	281.1	388.1
Central Java	32.1	5.1	53.2	90.4	172.7
Jogjakarta	1.3	1.7	5.3	8.3	14.7
East Java	35.4	15.3	62.0	112.7	226.0
West Kalimantan	0.3	3.2	7.8	11.3	23.2
Central Kalimantan	-	2.1	3.1	5.2	5.2
East Kalimantan	-	1.1	2.8	3.9	14.9
South Kalimantan	2.4	5.9	7.2	15.5	23.6
South Sulawesi	4.9	10.4	13.8	29.1	83.8
Bali	-	1.1	6.4	7.5	9.8
West Nusa Tenggara	1.6	-	6.7	8.3	10.7
Other Provinces					
Bengkula	-	2.0 f/	2.2	21.8 f/	108.0 f/
North Sulawesi	-		4.4		
Central Sulawesi	-		2.5		
South-East Sulawesi	-		2.5		
East Nusa Tenggara	-		7.0		
Maluku	-		0.6		
West Irian	-		0.6		
INDONESIA	299.5	117.0	405.5	822.0	1,555.1

c/ Data derived from Table 6.7. Estimated storage capacity of 100 tons at each rice mill.

d/ Data derived from Table 6.7. Estimated storage capacity of 10 tons at each huller and as estimated storage capacity of 3 tons at each water wheel mill.

e/ Based on the assumption that the storage not reported in a province is approximated equal to the percent of grain marketed (25 percent) to supply one month's consumption, multiplied by 1.5 to convert rice to gabah. Example: Atjeh - From Table 8.3 the 1970 consumption is 290,000 tons of rice. Thus (290,000) (0.25) (1/12) (1.5) 9.1 thousand tons of gabah storage capacity equivalent. In Djakarta 100 percent of the grain is marketed.

f/ Data not available by provinces.

REFERENCE: "Economic and Engineering Study -- Rice Storage Handling and Marketing - The Republic of Indonesia," Weitz-Hettelsater Engineering, Inc., 1972.

KOREA

Warehouse capacities reported in data presented here is in "straw bags." It is estimated that each straw bag has an approximate capacity of 54 Kg of rice. Using this assumption the total warehouse capacity for Korea would be approximately 533,167 metric tons.

REPUBLIC OF KOREA

WAREHOUSE CAPACITY BY PROVINCES - 70% OF CAPACITY UTILIZED

Province	Class A			Class B		
	No. of Whses	Area in Pyong	Capacity in Straw Bag	No. of Whses	Area in Pyong	Capacity in Straw Bag
Seoul	17	2,368	142,080	19	2,198	118,692
Pusan	22	6,943	416,580	16	3,351	180,954
Kyonggi	50	6,054	318,900	133	13,094	665,146
Kangwon	--	--	--	50	6,616	357,264
Chung-Puk	2	240	14,400	150	9,626	530,604
Chung-Nam	8	1,378	82,680	70	5,464	295,056
Chon-Puk	70	13,162	353,880	52	5,102	275,508
Chon-Nam	38	4,618	277,080	158	19,528	1,246,211
Kyong-Puk	64	7,942	476,520	148	12,162	656,748
Kyong-Nam	20	4,284	276,600	91	8,444	266,652
Cheju	0	0	0	0	0	0
TOTAL	291	46,989	2,358,720	887	85,585	4,592,835

Table Continued-

Province	Class C			Low Temperature			Total		
	No. of Whses	Area in Pyong	Capacity in Straw Bag	No. of Whses	Area in Pyong	Capacity in Straw Bag	No. of Whses	Area in Pyong	Capacity in Straw Bag
Seoul	34	4,825	202,650	2	800	104,000	72	10,191	567,422
Pusan	1	117	4,914	2	400	52,000	41	10,811	654,448
Kyonggi	196	8,886	373,212	--	--	--	379	28,034	1,357,258
Kangwon	114	10,106	424,452	--	--	--	164	16,722	781,716
Chung-Puk	84	2,580	108,360	--	--	--	236	12,446	653,364
Chung-Nam	8	352	14,784	--	--	--	86	7,194	392,520
Chon-Puk	162	9,086	381,612	--	--	--	284	27,350	1,011,000
Chon-Nam	352	18,600	656,340	--	--	--	548	42,746	2,179,631
Kyong-Puk	204	9,350	392,698	--	--	--	416	29,454	1,525,966
Kyong-Nam	94	4,926	206,892	--	--	--	205	17,654	750,144
Cheju	0	0	0	0	0	0	0	0	0
TOTAL	1,249	68,828	2,765,914	4	1,200	156,000	2,431	202,602	9,873,469

REFERENCE: Ackels, A.A., M.M. Keck and P.J. Gormley (1969) "Review of Grain, Storage, Handling, Processing and Distribution Problems and Proposals in the Republic of Korea." Food Grain Drying, Storage Handling and Transportation Report No. 6, Food and Feed Grain Institute, Kansas State University.

STANDARD WEIGHTS PER UNIT VOLUME: 1 Standard straw bag polished rice = 80 Kg; 1 standard straw bag paddy rice = 54 Kg; 1 standard straw bag barley = 50 Kg; 1 standard straw bag naked barley = 60 Kg; 1 standard straw bag wheat = 60 Kg; 1 standard straw bag polished barley = 60 Kg.

WHEAT STORAGE CAPACITY OF EACH FLOUR MILL
IN REPUBLIC OF KOREA

No.	Name of Mills	Milling Capacity (Bl.)	Wheat Storage Capacity in... Warehouse (MT)	Silo (MT)	Open (MT)
1.	Daehan	10,005	4,580	14,000	47,200
2.	Dong-A (Pusan)	4,926	5,500	10,000	3,000
3.	Daesun	2,377	24,285	5,100	16,000
4.	Hando	1,138	3,884	-	120
5.	Shinhan	2,916	1,200	3,830	8,000
6.	Honam	1,503	22,000	400	800
7.	Shinheung (Chungju)	2,308	23,000	800	10,000
8.	Cheil	5,453	4,000	10,000	10,000
9.	Samwha	2,237	6,000	-	14,000
10.	Poongkuk	1,013	8,142	-	7,488
11.	Daewang	1,205	8,000	-	8,000
12.	Hanil (Pusan)	1,579	364	6,000	5,000
13.	Hanil (Seoul)	2,568	10,000	-	50,000
14.	Shinkeuk-dong	2,282	6,000	6,000	500
15.	Dongbang	1,579	8,000	-	5,000
16.	Yungnam	1,239	6,000	-	3,000
17.	Namkok	1,025	2,500	-	3,000
18.	Keumsung	1,207	4,725	600	7,000
19.	Daedong	1,185	5,000	-	-
20.	Daesung	896	4,670	-	7,405
21.	Dong-A (Inchon)	3,338	3,000	8,000	4,000
22.	Shinheung (Taejon)	1,132	3,600	-	10,000
	TOTAL	53,111	164,450	64,730	219,513

PRESENT DOCK SIDE WHEAT WAREHOUSES FOR IMPORTED GRAIN

Unit: MT

Name	City	Silo	Warehouse	Total
Daehan	Inchon	14,000	4,580	18,580
Dong-A	Pusan	10,000	5,500	15,500
Shinkeuk-Dong	Pusan	6,000	6,000	12,000
Hanil	Pusan	6,000	364	6,364
TOTAL		36,000	16,444	52,444

REFERENCE: Ackels, A.A., M.M. Keck and P.J. Gormley (1968) "Review of Grain, Storage, Handling, Processing and Distribution Problems and Proposals in the Republic of Korea." Food Grain Drying, Storage, Handling and Transportation Report No. 6, Food and Feed Grain Institute, Kansas State University.

MALAYSIA/SINGAPORE

In general, there are three categories of storage in Malaysia: farm storage, small commercial stores, and government, large cooperative and commercial godowns. The various types of farm storage range in size from 350 lbs. to 32,000 lbs., are characteristic for an area and are primarily constructed of wood, bamboo or tree bark. Small commercial stores hold rice in 220 lb. sacks stacked 12-14 bags high in ground-floor shops of brick or cement construction. Capacities range from 400-600 sacks. Government, cooperative and commercial godowns of concrete or brick masonry or corrugated metal have wood, concrete or padi husk floors. Average capacity of godowns is 5,000 metric tons (sack storage) with a few of 150,000 M.T. capacity.[1)]

It is estimated that approximately 40 percent of 1.1 million long tons of locally produced rice is consumed at the farm level and that the remaining 60 percent is bought by the National Padi and Rice Authority and the private millers in roughly equal portions.[2)]

Singapore's rice storage facilities are estimated at 200,00 tons with the private sector accounting for 150,000 tons and the public sector 50,000 tons. If necessary Singapore can easily expand its rice storage capacity substantially since approximately 5 square miles of warehousing facilities exist here. Nearly all of the "godowns" are of steel and corrugated metal with concrete floors.[2)]

Capacities of modern wheat storage silos for Malaysia/Singapore are shown in the accompanying table.[2)]

MALAYSIA/SINGAPORE
WHEAT STORAGE

Peninsular Malaysia	Silo Capacity
United Malayan Flour Mills Bhd. Butterworth, Province Wellesley, Penang	16,000 long tons
Malayan Flour Mills Bhd. Lumut, Perak	30,000
Federal Flour Mills Bhd. Port Kelang, Selangor	24,000
Total	70,000 long tons
Singapore	
Prima Limited Keppel Road Singapore 2	50,000 long tons
National Grain Elevator Ltd.[1/] Jurong, Singapore 22	30,000
F. E. Zuellig (Trading)Pte. Ltd. Jurong, Singapore 22	20,000
Khong Guan Flour Milling Ltd. Tanjong Rhu, Singapore 4	15,000
Total	115,000 long tons

1/For rental for storage of corn, soybeans and wheat

1)Singh, K.I. (1972) Insect Pests of Stored Padi and Rice in West Malaysia. Trop. Stored Prod. Info. No. 23.

2)Personal Communication, U.S. Agricultural Attaché, February 21, 1975.

PHILIPPINES

Data included here indicates that approximately 18 percent of warehousing capacity is operated by the Farmer's Cooperative Marketing Association (FACOMA), 8 percent by the Rice and Corn Administration (RCA) and 74 percent is privately owned. In general, the warehouses in use have concrete floors and walls of corrugated metal or concrete blocks and corrugated metal roofs. Indications are that most of the warehouses are in relatively poor condition from the standpoint of maintenance and sanitation.

Bulk silo storage facilities are owned and operated by private grain processors (213,700 M.T.) and government agencies (15,050 M.T.). The relatively new privately owned silos are efficiently and effectively operated. The government silos are in need of rehabilitation.

Recent data supplied by the National Grain Authority[1)] indicates the grain storage capacities for the Philippines as shown in Table 3.

[1)] National Grains Authority, January 13, 1975.

TABLE 1. PHILIPPINES: EXISTING WAREHOUSE FACILITIES (IN SACKS) BY OWNERSHIP BY PROVINCES AND REGIONS, 1967

REGION AND PROVINCE	FACOMA			RCA			PRIVATE			TOTAL		
		Capacity a/			Capacity a/			Capacity a/			Capacity a/	
	No.	In Cavans	In Metric Tons	No.	In Cavans	In Metric Tons	No.	In Cavans	In Metric Tons	No.	In Cavans	In Metric Tons
I MANILA	-	-	-	9	418,000	19,228	38	467,200	21,491	47	885,200	40,719
II ILOCOS	77	1,960,000	48,760	-	-	-	61	478,500	22,011	138	1,538,500	70,771
Abra	7	97,000	4,462	-	-	-	1	7,000	322	8	104,000	4,784
Ilocos Norte	15	228,000	10,488	-	-	-	45	62,500	2,875	60	290,500	13,363
Ilocos Sur	29	470,000	21,620	-	-	-	1	5,000	230	30	475,000	21,850
La Union	19	187,000	8,602	-	-	-	4	190,500	8,763	23	377,500	17,365
Mt. Province	7	78,000	3,588	-	-	-	10	213,500	9,821	17	291,500	13,409
III CAGAYAN VALLEY	46	1,495,000	68,770	6	310,000	14,260	234	3,029,500	139,357	286	4,834,500	222,387
Cagayan	20	530,000	24,380	4	205,000	9,430	46	328,000	15,088	70	1,063,000	48,898
Isabela	19	690,000	31,740	2	105,000	4,830	120	1,643,000	75,578	141	2,438,000	112,148
Nueva Vizcaya	7	275,000	12,650	-	-	-	67	1,057,500	48,645	74	1,332,500	61,295
Batanes	-	-	-	-	-	-	1	1,000	46	1	1,000	46
IV CENTRAL LUZON	94	2,763,000	127,098	18	1,534,300	70,578	763	11,950,600	549,728	875	16,247,900	747,404
Bataan	5	110,000	5,060	-	-	-	54	312,000	14,352	59	422,000	19,412
Bulacan	19	1,133,000	52,118	-	-	-	194	2,423,300	111,472	213	3,556,300	163,590
Nueva Ecija	23	654,200	30,093	15	1,297,300	59,676	255	2,704,600	124,412	293	4,656,100	214,181
Pampanga	18	260,800	11,997	1	80,000	3,680	87	2,859,200	131,523	106	3,200,000	147,200
Pangasinan	17	355,000	16,330	2	157,000	7,222	74	1,861,500	85,629	93	2,373,500	109,181
Tarlac	11	240,000	11,040	-	-	-	71	1,620,000	74,520	82	1,860,000	85,560
Zambales	1	10,000	460	-	-	-	28	170,000	7,820	29	180,000	8,280
V SOUTHERN TAGALOG	21	426,800	19,633	2	71,500	3,289	298	2,032,700	93,504	321	2,531,000	116,426
Batangas	1	20,000	920	-	-	-	68	240,000	11,040	69	260,000	11,960
Cavite	1	10,000	460	-	-	-	50	314,000	14,444	51	324,000	14,904
Laguna	5	117,800	5,419	-	-	-	41	200,200	9,209	46	318,000	14,628
Marinduque	-	-	-	-	-	-	6	34,000	1,564	6	34,000	1,564
Mindoro Occidental	1	17,800	819	-	-	-	16	267,200	12,291	17	285,000	13,110
Mindoro Oriental	1	17,800	819	-	-	-	20	192,200	8,341	21	210,000	9,660
Palawan	1	20,000	920	1	41,500	1,909	6	28,500	1,311	8	90,000	4,140
Quezon	-	-	-	1	30,000	1,380	70	250,000	11,500	71	280,000	12,880
Rizal	11	223,400	10,276	-	-	-	21	506,600	23,304	32	730,000	33,580

Table Continued-

REGION AND PROVINCE	FACOMA No.	FACOMA Capacity a/ In Cavans	FACOMA Capacity a/ In Metric Tons	RCA No.	RCA Capacity a/ In Cavans	RCA Capacity a/ In Metric Tons	PRIVATE No.	PRIVATE Capacity a/ In Cavans	PRIVATE Capacity a/ In Metric Tons	TOTAL No.	TOTAL Capacity a/ In Cavans	TOTAL Capacity a/ In Metric Tons
VI BICOL	13	238,400	10,967	3	100,000	4,600	156	1,149,600	52,881	172	1,488,000	68,488
Albay	2	35,600	1,638	2	75,000	3,450	30	301,400	13,864	34	412,000	18,952
Camarines Norte	-	-	-	-	-	-	28	224,000	10,304	28	224,000	10,304
Camarines Sur	9	175,000	8,050	1	25,000	1,150	47	375,000	17,250	57	575,000	26,450
Catanduanes	-	-	-	-	-	-	10	55,000	2,530	10	55,000	2,530
Masbate	-	-	-	-	-	-	17	72,000	3,312	17	72,000	3,312
Sorsogon	2	27,800	1,279	-	-	-	24	122,200	5,621	26	150,000	6,900
VII WESTERN VISAYAS	31	624,800	28,740	2	164,000	7,544	221	2,287,700	105,234	254	3,076,500	141,518
Aklan	-	-	-	-	-	-	15	20,500	943	15	20,500	943
Antique	-	-	-	-	-	-	17	55,800	2,567	17	55,800	2,567
Iloilo	18	358,600	16,495	1	144,000	6,624	81	1,092,000	50,232	100	1,594,600	73,351
Capiz	6	115,600	5,317	-	-	-	15	229,000	10,534	21	344,600	15,851
Negros Occidental	7	150,600	6,928	1	20,000	920	52	761,400	35,024	60	932,000	42,872
Negros Oriental	-	-	-				32	99,000	4,554	32	99,000	4,554
Romblon	-	-	-				9	30,000	1,380	9	30,000	1,380
VIII EASTERN VISAYAS	8	105,000	4,830	2	21,200	975	148	1,399,300	64,368	158	1,525,500	70,173
Bohol	1	20,000	920	-	-	-	20	33,000	1,518	21	53,000	2,438
Cebu	-	-	-	-	-	-	40	844,000	38,824	40	844,000	38,824
Leyte	7	85,000	3,910	-	-	-	58	268,000	12,328	65	353,000	16,238
Samar	-	-	-	2	21,200	975	30	254,300	11,698	32	275,500	12,673
IX SOUTHERN AND WESTERN MINDANAO	19	410,000	18,860	5	389,600	17,922	299	5,368,400	246,947	323	6,168,000	283,729
Cotabato	11	285,000	13,110	2	160,000	7,360	154	4,038,300	185,762	167	4,483,300	206,232
Davao	3	45,000	2,070	3	229,600	10,562	60	245,000	11,270	66	519,600	23,902
Sulu	-	-	-	-	-	-	5	50,000	2,300	5	50,000	2,300
Zamboanga del Norte	-	-	-	-	-	-	45	188,100	8,653	45	188,100	6,653
Zamboanga del Sur	5	80,000	3,680	-	-	-	35	847,000	38,962	40	927,000	42,642
X NORTHERN AND EASTERN MINDANAO	9	167,800	7,719	-	-	-	129	1,131,200	52,035	138	1,299,000	59,754
Agusan	2	50,000	2,300	-	-	-	8	31,000	1,426	10	81,000	3,726
Bukidnon	2	40,000	1,840	-	-	-	5	12,000	552	7	52,000	2,392
Lanao	-	-	-	-	-	-	63	590,000	27,140	63	590,000	27,140
Misamis Occidental	-	-	-	-	-	-	15	35,000	1,610	15	35,000	1,610
Misamis Oriental	2	40,000	1,840	-	-	-	13	171,000	7,866	15	211,000	9,706
Surigao	3	37,800	1,739	-	-	-	25	292,200	13,441	28	330,000	15,180
PHILIPPINES	318	7,290,800	335,377	47	3,008,600	138,396	2,347	29,294,700	1,347,556	2,712	39,594,100	1,821,329

REFERENCE: "Economic and Engineering Feasibility Study -- Storage Handling and Marketing of Selected Crops in the Republic of the Philippines," Weitz-Hettelsater Engineering, 1968.

TABLE 2. EXISTING BULK SILO GRAIN STORAGE FACILITIES, PHILIPPINES, 1967[b]

Owner	Location	Capacity[a] (Metric Tons)	Design
Continental Grain Company	Pasig, Rizal	31,000 [b][c]	Concrete
Republic Flour Mills, Inc.	Pasig, Rizal	25,000 (Wheat)	Concrete
Willington Flour Mills, Inc.	Pasig, Rizal	15,200 (Wheat)	Concrete
Liberty Flour Mills, Inc.	Mandaluyong, Rizal	15,000 (Wheat)[b]	Concrete
Philippines Flour Mills	Hondagua, Quezon	20,000 (Wheat)	Concrete
General Milling Corp.[d]	Lapu-Lapu City, Cebu	60,000 (Wheat)[b]	Concrete
General Milling Corp.[d]	General Santos, Catabato	2,800 (Corn)	Steel
Pillsbury - Mindanao Flour Milling Co., Inc.[d]	Iligan City, Lanao del Norte	13,700 (Wheat)	Concrete
Universal Corn Products, Inc.	Pasig, Rizal	31,000 (Corn & Soyabeans)[b]	Concrete
RCA Facility	Digos, Davao	5,600 (Rice & Corn)	Wood
RCA Facility	Camalaniugan, Cagayan	2,200 (Rice & Corn)	Wood
ACA Facility	San Jose, Nueva Ecija	1,800 (Rice)	Steel
ACA Facility	Solano, Nueva Vizcaya	5,450 (Rice)	Steel

a) The storage capacities represent volume for bulk grains and do not include warehouse sack storage.

Reference: "Economic and Engineering Feasibility Study--Storage Handling and Marketing of Selected Crops in the Republic of the Philippines," Weitz-Hettelsater Engineering, 1968.

b) Data modified on basis of data supplied by the National Grains Authority, 13 Jan 1975.

c) An additional 16,000 M.T. to be added.

d) Ship-to-shore unloading facilities available.

TABLE 3. GRAIN STORAGE CAPACITIES - PHILIPPINES

	Rice M.T.	Corn M.T.		Total M.T.	Type of Facilities
NGA[1] Owned	153,680	3,714	--	157,394	Warehouses/Silos
NGA Leased	169,422	52,615	--	222,037	Warehouses
Commercial	1,614,701	205,923	135,054	1,955,678	Warehouses/Silos
Flour Millers	--	1,062	62,472	63,534	Warehouses
	--	4,000	209,860	213,860	Silos
ACA Warehouses	55,258	23,682	--	78,940	Warehouses
TOTALS	1,993,061	290,996	407,386	2,691,443	Warehouses/Silos

1) National Grains Authority

SOURCE: Personal Communication, U.S. Agricultural Attaché, April 8, 1975. (Data from National Grains Authority)

TAIWAN

In addition to the data presented in the accompanying table, a recent report supplied by the U.S. Agricultural Attache (February 28, 1975) discussing port site and grain processing storage indicated the following:

Port of Keelung (located in northern part of Taiwan)

The port facility here has a storage capacity of 50,500 M.T. and is equipped with one (1) unloading units rated at 200 M.T./hour and two (2) units rated at 100 M.T./hour.

Port of Taichung (located in central part of Taiwan

A new facility is being built with expected use in 1977. Capacity of this unit is unknown.

Port of Kaoshiung (located in southern part of Taiwan)

One storage facility of 40,000 M.T. capacity for barley and wheat is equipped with two (2) unloading units rated at 200 M.T./hour each. A second facility for handling soybeans and corn has storage capacity of 15,000 M.T. A third facility under construction will have 40,000 M.T. capacity and a fourth facility of 60,000 M.T. capacity is to be constructed.

Grain storage facilities at grain processing facilities in Taiwan were indicated as follows:

Oat Mills - Storage capacity in metric tons.

	Bulk	Bag	Total
In use	126,250	95,572	221,822
Under construction	40,750	7,560	48,310
TOTALS	167,000	103,132	270,132

Flour Mills - Storage capacity in metric tons

	Bulk	Bag	Total
In use	70,000	120,000	190,000
Under construction	200,000	--	200,000
TOTALS	270,000	120,000	390,000

Feed and Oil Processing - Storage capacity in metric tons

	Bulk	Bag	Total
In use	125,000	348,000	473,000
Under construction	215,000	117,000	332,000
TOTALS	330,000	465,000	805,000

TAIWAN

EXISTING STORAGE CAPACITY[1)]

	Total	Rice	Wheat	Feeds	Oil	Cereal Grains	Barley Flake	Brewery	Harbor Bureau	Cargo Service	Supply Bureau
					Unit: 1,000 metric ton						
Storage in Bulk	773.2	12.2	236.6	238.9	118.1	-	67.3	9.6	90.5	-	-
Storage in Bags	1,829.2	664.1	149.5	368.3	203.0	18.6	88.1	12.5	146.0	152.6	25.7
Grand Total	2,602.7	676.5	386.4	606.8	321.0	18.7	155.5	22.1	236.5	152.8	25.9

1) Personal communication, U. S. Agricultural Attaché, February 28, 1975. Data from Grain and Feeds Development Foundation.

THAILAND

There is only limited information on the grain storage capacity of Thailand. A large portion of the grain is stored in the millions of producers farm homes and there is no estimate of this capacity.

About 90 percent or more of the total known storage capacity is for flat storage of bagged grains. Ten percent or less of the storage is in the form of bulk or silo storage.

Grain storage in Thailand is divided into two main categories, Rice and Coarse Grains, with the following estimated storage capacities:

COMMERCIAL GRAIN STORAGE

	Paddy (Rough Rice)	Milled Rice	Corn & Sorghum
	(X1,000 MT)		
1. Domestic			
Dealer (Middle-man)	1,000,000	--	--
Rice Mills	3,000,000	600,000	
Up-Country Storage	--	--	500,000
2. Exporter	1,000,000	500,000	600,000
TOTAL	5,000,000	1,100,000	1,100,000

Reference: Personal Communication, U. S. Agricultural Attaché, February 19, 1975.

SOUTH VIETNAM

No data on farm storage capacities are given here. It is estimated, however, that roughly 73 percent of rice produced remains on farms for home consumption.

QUALITY OF PADDY STORED AT WAREHOUSES
SOUTH VIETNAM, APRIL 30, 1969

Province	Storage Capacity	Total Paddy in Storage	Quality and/or Type					Amount Shipped Out During Past Seven Days
			High	Ordinary	Low	Red Grain	Than Nong	
			(Metric Tons)					
An Giang	33,203	12,936	4,375	5,069	3,267	205	20	37
An Xuyen	11,116	2,978	991	1,987	-	-	-	1,868
Ba Xuyen	25,088	19,236	6,504	12,716	16	-	-	1,220
Bac Lieu	746	409	-	409	-	-	-	-
Chau Doc	3,947	1,805	557	849	399	-	-	-
Dinh Tuong	3,084	1,920	1,381	539	-	-	-	-
Go Cong	-	-	-	-	-	-	-	-
Kien Giang	52,075	23,057	4,853	940	-	17,264	-	75
Kien Hoa	3,907	1,661	1,513	137	9	2	-	90
Kien Phong	N.A.	2,334	-	1,125	-	1,209	-	-
Long An	3,258	2,364	864	1,031	55	218	196	300
Phong Dinh	17,708	11,045	9,204	1,718	12	111	-	4,028
Vinh Binh	6,289	5,702	3,215	2,403	84	-	-	-
Vinh Long	749	345	52	293	-	-	-	528
Sa Dec	N.A.	2,431	470	1,693	157	83	28	-
TOTAL	161,170	88,223	33,979	30,909	3,999	19,092	244	8,146
Bien Hoa	-	-	-	-	-	-	-	-
Binh Duong	1,925	915	25	768	-	-	122	46
Gia Dinh	7,504	2,641	42	2,578	21	-	-	-
Phuoc Tuy	2,130	-	-	-	-	-	-	-
Tay Ninh	N.A.	400	400	-	-	-	-	-
TOTAL	11,559	3,956	467	3,346	21	-	122	46
Binh Dinh	-	-	-	-	-	-	-	-
Phu Yen	582	285	102	109	36	9	29	-
Quang Ngai	-	-	-	-	-	-	-	-
Thua Thien	-	-	-	-	-	-	-	-
TOTAL	582	285	102	109	36	9	29	-
GRAND TOTAL	173,311	92,464	34,548	34,364	4,056	19,101	395	8,192

SOURCE: Agricultural Economics and Statistics Service

REFERENCE: Wildman Agricultural Research, Inc. (1970) "Economic and Engineering Study of Grain Storage

QUALITY OF PADDY STORED AT RICE MILLS
SOUTH VIETNAM, APRIL 30, 1969

Province	Storage Capacity	Total Paddy in Storage	Quality and/or Type					Amount Shipped Out During Past Seven Days
			High	Ordinary	Low	Red Grain	Than Nong	
			(Metric Tons)					
An Giang	20,890	6,970	776	1,883	4,250	-	61	4
An Xuyen	13,688	169	27	137	5	-	-	-
Ba Xuyen	89,110	53,138	42,278	8,160	2,700	-	-	-
Bac Lieu	19,301	17,564	2,239	15,325	-	-	-	233
Chau Doc	7,762	628	74	176	378	-	-	11
Dinh Tuong	9,877	8,876	2,357	5,519	679	204	117	54
Go Cong	9,400	5,028	1,626	3,200	202	-	-	71
Kien Giang	N.A.	24,818	17,963	5,063	-	1,792	-	-
Kien Hoa	6,683	1,024	313	336	31	330	14	11
Kien Phong	N.A.	-	-	-	-	-	-	-
Long An	37,163	20,510	13,913	6,178	-	15	404	-
Phong Dinh	21,676	17,853	3,619	13,364	757	113	-	730
Vinh Binh	11,382	2,134	674	1,455	3	2	-	227
Vinh Long	N.A.	-	-	-	-	-	-	-
Sa Dec	7,338	2,471	391	1,557	40	483	-	-
TOTAL	254,270	161,183	86,250	62,353	9,045	2,939	596	1,341
Bien Hoa	518	182	25	139	18	-	-	10
Binh Duong	41	12	1	11	-	-	-	-
Gia Dinh	4,422	2,004	332	1,648	16	8	-	5
Phuoc Tuy	540	244	135	94	15	-	-	-
Tay Ninh	1,903	1,394	6	1,068	-	320	-	1
TOTAL	7,424	3,836	499	2,960	49	328	-	16
Binh Dinh	77	14	-	14	-	-	-	-
Phu Yen	N.A.	35	30	3	1	1	-	-
Quang Ngai	(nt)	3	-	3	-	-	-	4
Thua Thien	161	32	18	13	1	-	-	9
TOTAL	238	84	48	33	2	1	-	13
GRAND TOTAL	261,932	165,103	86,797	65,346	9,096	3,268	596	1,370

SOURCE: Agricultural Economics and Statistics Service.

LATIN AMERICA APPENDIX

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ARGENTINA

Although Argentina is not generally included among the developing countries, data on storage capacities was available and is included here for reference and to illustrate the type of information that would be desirable in a report such as this.

Data from two sources are included. Fienup (1969) includes both "official" and "private" capacities, whereas, the more detailed data of Agri-Research (1967) includes only "official" storage.

ARGENTINA: Capacity of Grain Storage in Official and Private Installations
(Thousands of metric tons)

Description	1954	1964	1965	1966
Official port installations	-	3,092	3,403	3,194
Elevators	-	925	999	985
Underground silos	a	1,504	1,509	1,468
Farm-type silos	-	-	190	195
Bag storage	896	664	705	546
Official field installations	-	924	1,079	1,086
Elevators	122	323	336	336
Underground silos	a	601	672	672
Farm-type silos	-	-	71	78
Total official installations	1,965[a]	4,017	4,482	4,280
Private elevators	-	-	1,156	1,711[b]
Private farm silos	-	-	2,000	2,000[b]
Total private installations	-	-	3,156	3,711[b]
GRAND TOTAL	-	-	7,638	7,991

a) In the capacity of the underground silos (947,000 tons) a distinction has been made between port and field silos.

b) Estimated figures.

Source: Junta Nacional de Granos, 1965.

Reference: Fienup, D. E. et al. 1969. "The Agricultural Development of Argentina," New York: F. A. Praeger.

ARGENTINA

Total Elevator and Flat Storage Capacity By Export Zone
(metric tons)

Export Zone	Port Facilities			Country Facilities		Port and Country Units			
	Elevator Space		Underground storage	Elevators	Underground storage	Elevators	Underground storage	Total Bulk	Total with bag storage of port
	Bulk	Bag							
1. Bahia Blanca	161,498	76,510	304,000	208,167	170,600	369,665	474,600	844,265	920,775
2. Necochea	92,900	34,620	300,000	62,692	75,600	155,592	375,600	531,192	565,812
3. Mar del Plata	-	20,500	-	-	-	-	-	-	20,500
4. Buenos Aires	235,595	167,570	90,000	124,400	124,600	359,995	214,600	524,595	742,165
5. Rosario	393,316	283,500	827,800	462,425	302,000	855,741	1,129,800	1,985,541	2,269,041
6. Santa Fe	71,230	69,900	-	22,130	-	93,360	-	93,360	163,260
7. Diamante	-	31,870	-	-	-	-	-	-	31,870
8. Concepcion del Uruguay	3,100	31,860	-	11,200	-	14,300	-	14,300	46,160
TOTAL	957,639	716,330	1,521,800	891,014	672,800	1,848,653	2,194,600	3,993,253	4,759,583

Reference: "Adjusting Grain Marketing Facilities and Practices in Argentina to Meet Projected Requirements", Agri Research, Inc. Manhattan, Kansas, Dec., 1962.

ARGENTINA

CAPACITY AND OPERATING VOLUME OF OFFICIAL COUNTRY ELEVATORS, 1959-1961

LOCATION AND YEAR		TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENTS			CONDITIONING				TONS - DAYS STORAGE
			BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
43. Alberti	1959	5,300	499	238	737	-	-	-	47	139	186	-	-	491	-	28,176
	1960		3,436	674	4,110	11	-	11	769	3,744	4,513	1,323	1,070	916	-	408,803
	1961		3,822	225	4,047	47	-	47	242	3,804		116	257	59	-	322,644
13. Alcorta	1959	6,500	9,518	9,341	18,859	-	-	-	70	19,587		6,481	5,036	18,328	18	1,025,006
	1960		3,128	12,899	16,027	89	228	317	28	16,218		11,115	4,944	15,498	-	846,582
	1961		6,361	2,790	9,171	9	20	29	354	9,923		5,741	1,893	9,082	-	546,853
19. Alejandro	1959	2,750	610	-	610	-	-	-	610	1,810		876	150	-	-	223,136
	1960		4,067	-	4,067	-	-	-	122	2,099		4,600	-	-	-	781,490
	1961		417	-	417	-	-	-	80	2,151		4,082	-	-	-	170,968
7. A. Ledesma	1959	9,700	4,536	1,920	6,456	-	-	-	-	6,984		7,855	38	1,721	1	1,284,434
	1960		7,294	1,409	8,703	-	-	-	263	5,629		11,992	1,509	1,775	-	2,157,637
	1961		1,008	118	1,126	-	-	-	93	5,506		9,183	202	731	-	1,005,739
23. Amenabar	1959	2,750	5,521	278	5,799	-	-	-	-	5,495		-	-	288	1	262,019
	1960		2,835	326	3,151	-	-	-	21	3,066		3,028	267	-	-	844,458
	1961		1,936	-	1,936	-	-	-	205	1,950		362	-	-	-	296,062
3. Armstrong	1959	6,500	8,075	4,083	12,158	-	-	-	-	8,105		10,638	1,770	4,414	14	1,576,710
	1960		5,620	3,970	9,590	72	87	159	121	9,963		14,243	2,096	6,066	-	1,587,370
	1961		720	1,214	1,934	-	-	-	16	5,106		5,082	-	443	-	521,485

Reference: "Adjusting Grain Marketing Facilities and Practices in Argentina to Meet Projected Requirements", Agri Research, Inc., Manhattan, Kansas, Dec., 1962.

(Table continued)

CAPACITY AND OPERATING VOLUME OF OFFICIAL COUNTRY ELEVATORS, 1959-1961

LOCATION AND YEAR	TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENTS			CONDITIONING				TONS - DAYS STORAGE
		BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
38. Arribeños 1959	5,300	3,870	11,925	15,795	3	-	3	2,188	12,020		1,967	736	12,270	-	729,518
1960		3,060	11,542	14,602	19	18	37	4,737	12,155		3,470	7,450	3,314	-	1,035,167
1961		3,026	2,906	5,932	-	-	-	1,145	4,932		817	2,087	868	-	592,415
26. Ballestros 1959	5,300	164	3,001	3,165	-	13	13	-	2,069		3,037	40	-	1	464,442
1960		5,100	1,206	6,306	-	116	116	306	4,288		11,998	-	465	-	1,508,972
1961		522	2,819	3,341	-	-	-	21	6,072		4,026	-	63	-	817,038
35. Bellville 1959	5,300	9,043	677	9,720	213	217	430	-	10,571		779	631	-	1	694,954
1960		6,106	353	6,459	145	214	359	-	1,540		12,965	-	309	-	1,775,877
1061		1,211	2,502	3,713	-	223	223	66	8,816		5,483	-	184	-	919,820
8. Cabrera 1959	6,500	4,390	250	4,640	-	-	-	-	2,320		5,327	531	-	-	904,822
1960		4,929	153	5,082	18	-	18	346	3,622		7,074	-	320	-	1,718,286
1961		2,341	433	2,774	45	-	45	993	5,419		2,663	-	510	-	1,303,296
28. Cintra 1959	5,300	3,579	711	4,290	-	-	-	-	3,509		7,878	41	-	6	681,156
1960		5,413	385	5,798	-	-	-	27	1,318		16,409	-	-	-	1,636,158
1961		-	-	-	-	-	-	-	5,255		726	-	-	-	350,741
37. Col.Pringles 1959	5,300	5,106	13,765	18,871	865	5,678	6,543	-	18,945		-	-	-	-	1,367,736
1960		2,504	8,129	10,633	3	1,542	1,545	-	10,964		2,091	-	-	-	1,661,899
1961		868	8,538	9,406	42	1,535	1,577	740	11,312		1,371	-	1,243	-	929,128

(Table continued)

ARGENTINA

CAPACITY AND OPERATING VOLUME OF OFFICIAL COUNTRY ELEVATOR, 1959-1961

LOCATION AND YEAR		TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENT			CONDITIONING				TONS - DAYS STORAGE
			BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
42. Copetonas	1959	5,300	-	47	47	-	-	-	-	46		-	-	-	-	-
	1960		644	3,165	3,809	-	63	63	9	2,429		2,796	-	728	-	580,998
	1961		459	7,521	7,980	39	1,190	1,229	228	6,881		1,553	-	2,573	-	1,204,895
20. C.Ladeado	1959	2,750	4,963	718	5,681	-	-	-	-	6,598		1,333	-	-	6	459,013
	1960		3,318	389	3,707	-	-	-	-	2,625		4,792	-	-	-	777,058
	1961		17	795	812	-	13	13	-	1,846		1,417	-	-	-	236,024
27. Chovet	1959	9,700	9,375	9,054	18,429	-	-	-	-	22,740		4,911	2,669	14,897	-	1,078,102
	1960		5,671	12,457	18,128	-	-	-	-	20,657		7,815	4,468	9,088	-	1,416,859
	1961		1,654	1,419	3,073	-	-	-	-	3,027		-	1,031	1,385	-	70,856
14. Dominguez	1950	5,600	1,611	-	1,611	-	-	-	-	1,056		4,645	36	99	1	385,102
	1960		38	-	38	-	-	-	38	533		899	39	-	-	16,806
	1961		642	-	642	-	-	-	-	639		1,567	-	-	-	132,078
10. Elortondo	1959	4,870	3,421	4,003	7,424	-	-	-	-	6,875		1,144	-	4,827	1	368,131
	1960		832	6,610	7,442	-	-	-	-	7,775		6,735	2,639	1,318	-	757,593
	1961		137	853	990	-	-	-	-	2,351		220	33	751	-	126,665
2. Firmat	1959	9,000	843	16,832	17,675	-	-		-	20,020		14,163	627	13,916	-	1,689,173
	1960		1,036	19,987	21,023	-	-	-	170	19,281		4,060	4,532	-	9	1,841,550
	1961		440	3,217	3,657	-	151	151	-	6,639		3,345	-	325	-	596,408

(Table continued)

LOCATION AND YEAR	TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENT			CONDITIONING				TONS - DAYS STORAGE
		BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
6. Fuentes 1959	6,500	1,335	6,727	8,062	-	44	44	106	5,735		8,069	726	3,067	3	1,174,021
1960		2,433	3,911	6,344	-	539	539	6	9,528		3,142	671	6,080	-	590,942
1961		1,193	965	2,158	21	18	39	258	1,895		1,341	-	1,287	-	262,266
39. Gral. Arenales 1959	5,300	2,750	6,138	8,888	-	34	34	354	6,510		3,918	-	7,450	-	625,394
1960		1,282	6,904	8,186	-	109	109	220	8,425		5,059	3,821	-	-	543,991
1961		590	437	1,027	-	4	4	151	1,930		1,488	203	64	-	124,374
40. Gral. Viamonte 1959	5,300	7,305	2,267	9,572	-	-	-	156	8,399		4,410	34	4,110	3	582,616
1960		4,189	895	5,084	-	-	-	358	2,921		23,659	1,588	17	-	1,210,897
1961		5,618	60	5,678	448	-	448	132	7,881		8,285	-	117	-	619,443
18. Guatimozin 1959	2,750	3,761	5,038	8,799	-	-	-	-	9,270		4,454	-	7,785	8	504,886
1960		2,032	2,571	4,603	-	-	-	180	5,048		10,434	3,027	-	-	783,683
1961		315	500	815	-	-	-	-	1,654		458	133	-	-	44,642
41. Indio Rico 1959	5,300	-	45	45	-	-	-	-	43		-	-	-	-	-
1960		1,483	5,379	6,862	225	3,474	3,699	46	3,467		4,283	-	1,380	-	1,030,194
1961		138	5,143	5,281	304	3,467	3,771	262	6,168		1,853	-	3,056	-	1,282,638
22. Isla Verde 1959	2,750	3,430	3,110	6,540	87	75	162	32	8,460		3,866	-	-	6	420,180
1960		3,075	3,473	6,548	25	-	25	850	5,115		7,487	-	-	-	721,526
1961		2,189	1,220	3,409	10	218	228	610	4,090		303	-	-	-	184,030

(Table continued)

ARGENTINA

CAPACITY AND OPERATING VOLUME OF OFFICIAL COUNTRY ELEVATORS, 1959-1961

LOCATION AND YEAR	TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENTS			CONDITIONING				TONS - DAYS STORAGE
		BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
32. J. Posse	9,700	2,189	6,515	8,704	248	671	919	-	8,481		2,494 12,357	16	4,220	-	932,005
1960		7,762	2,010	9,772	-	-	-	-	1,038		6,296	260	44	-	2,998,550
1961		543	471	1,014	-	-	-	-	10,233			-	-	-	986,573
17. Las Junturas 1959	2,750	1,521	-	1,521	-	-	-	-	692		200	-	-	1	67,748
1960		2,492	-	2,492	-	-	-	573	2,022		3,629	-	-	-	591,480
1961		300	405	705	-	-	-	56	1,353		382	-	-	-	126,722
4. Leones 1959	6,500	6,238	2,742	8,980	-	2,177	2,177	-	8,699		3,138	-	-	-	1,454,994
1960		6,377	2,111	8,488	18	-	18	-	4,005		12,062	-	545	-	1,838,936
1961		2,390	622	3,012	246	127	373	-	7,673		4,068	-	462	-	840,210
30. Los Surgentes 1959	9,700	11,443	11,643	23,086	-	-	-	-	18,502		2,542	1,155	13,399	14	2,059,012
1960		7,603	7,336	14,939	-	-	-	679	10,792		17,073	4,652	2,128	-	2,859,144
1961		1,631	1,187	2,818	2	-	2	-	10,314		5,045	-	430	-	1,678,791
16. Naggiolo 1959	2,750	1,927	4,366	6,293	-	-	-	-	6,930		767	-	3,685	-	643,468
1960		2,532	4,308	6,840	35	331	366	175	6,671		2,493	1,695	239	-	628,932
1961		-	-	-	-	-	-	-	809		-	-	-	-	33,813
33. Maria Teresa 1959	5,300	7,998	11,564	19,562	-	-	-	208	19,864		1,467	4,155	15,801	-	725,414
1960		2,971	13,937	16,908	-	15	15	936	17,112		12,917	5,476	3,672	-	933,245
1961		2,898	1,510	4,408	-	23	23	89	4,335		104	1,166	2,984	-	152,199
24. Monte Buey 1959	2,750	4,283	48	4,331	-	-	-	-	4,327		60	-	-	4	339,259
1960		2,912	-	2,912	-	-	-	-	1,581		5,271	-	-	-	890,342
1961		1,438	855	2,293	-	-	-	-	3,581		1,459	-	-	-	491,496

(Table continued)

CAPACITY AND OPERATING VOLUME OF OFFICIAL COUNTRY ELEVATORS, 1959-1961

LOCATION AND YEAR	TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENTS			CONDITIONING				TON DAYS STORAGE
		BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
9. Monte Maiz 1959	6,500	5,129	5,134	10,263	-	-	-	-	13,548		5,190	333	4,617	7	1,389,594
1960		6,113	-	6,113	-	42	42	-	2,596		6,927	730	-	-	1,889,530
1961		903	336	1,239	-	86	86	2	6,925		3,759	-	162	-	1,049,622
29. Foetinger 1959	5,300	2,967	2,669	5,636	-	-	-	-	5,585		9,398	-	-	5	874,766
1960		3,789	1,437	5,226	-	-	-	-	724		15,102	-	-	-	1,610,365
1961		475	766	1,241	-	-	-	-	5,650		4,290	-	250	-	468,423
5. Oliva 1959	6,500	1,233	5,689	6,922	-	-	-	44	1,428		241	-	-	4	214,606
1960		2,827	8,369	11,196	23	-	23	894	14,222		10,605	-	1,610	-	1,001,496
1961		1,285	6,205	7,490	-	31	31	570	6,046		91	-	2,233	-	432,204
21. Pascanas 1959	2,750	3,316	113	3,429	-	-	-	-	3,574		98	-	-	6	209,994
1960		3,430	193	3,623	914	274	1,188	22	1,679		272	-	-	2	706,644
1961		1,416	248	1,664	20	51	71	87	3,431		695	-	-	-	317,220
12. R. Fournier 1959	6,500	7,175	6,436	13,611	-	-	-	-	15,346		5,280	173	11,162	22	1,150,014
1960		6,053	4,823	10,876	19	232	251	-	12,143		3,299	3,133	2,880	1	947,567
1961		2,922	2,368	5,290	-	-	-	-	6,564		421	706	2,611	-	232,259
25. Sancti Spiritu 1959	2,750	2,586	4,176	6,762	27	173	200	418	5,497		1,277	1,031	3,524	-	254,224
1960		1,779	5,179	6,958	90	35	125	404	6,958		7,989	2,028	2,599	-	477,902
1961		526	786	1,312	27	3	30	89	1,402		582	-	49	-	136,406

(Table continued)

ARGENTINA

CAPACITY AND OPERATING VOLUME OF OFFICIAL COUNTRY ELEVATORS, 1959-1961

Page 7.

LOCATION AND YEAR	TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENTS			CONDITIONING				TON DAYS STORAGE
		BAGS	BULK	TOTAL	BAGS	BULK	TOTAL/	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
36. S.J. Esquina	1959	9,700	1,391	8,255	9,646	-	18	18	-	6,884	821	1,627	7,741	-	299,631
	1960		4,504	6,135	10,639	-	-	-		12,535	2,131	3,013	6,800	-	761,173
	1961		478	69	547	-	-	-		537	-	81	138	-	29,363
11. San Marcos	1959	4,870	6,761	3,350	10,111	-	150	150	-	10,033	1,496	117	3,463	12	962,666
	1960		8,065	234	8,299	230	-	230	-	5,279	6,040	-	-	-	1,297,818
	1961		729	5	734	-	-	-	-	3,782	4,258	-	-	-	417,636
1. Tancacha	1959	6,500	5,741	102	5,843	-	-	-	-	5,883	4,574	-	-	-	654,239
	1960		4,520	-	4,520	-	-	-	144	6,204	11,199	-	-	-	1,175,559
	1961		132	-	132	-	-	-	52	555	222	-	-	-	22,357
34. Teodelina	1959	5,300	3,545	13,732	17,277	-	-	-	-	19,750	3,169	-	14,345	1	886,712
	1960		2,549	9,747	12,296	-	49	49	-	12,516	3,120	4,803	2,069	-	619,380
	1961		2,725	2,973	5,698	7	-	7	71	5,556	777	1,044	1,544	-	320,613
31. Villa Canas	1959	5,300	7,075	9,464	16,539	-	-	-	403	16,682	4,748	143	13,790	2	824,783
	1960		5,246	12,534	17,780	-	38	38	412	17,940	3,209	3,757	6,249	-	1,016,716
	1961		6,555	4,609	11,164	45	3	48	1,575	10,024	299	1,612	2,773	-	537,393
15. Villaguay	1959	5,600	6,770	-	6,770	154	-	154	306	4,977	9,600	2,308	2,304	2	1,176,312
	1960		2,433	30	2,463	-	-	-	610	2,756	4,841	2,586	1,176	-	391,633
	1961		2,047	-	2,047	-	-	-	1,760	584	1,278	2,850	971	-	188,790
47. Bragado	1959	Not in operation		-	-	-	-	-	-	-	-	-	-	-	N.O.P.
	1960	5,300	85	61	146	-	23	23	43	101	-	67	-	-	5,447
	1961		2,375	337	2,712	9	6	15	503	2,123	129	211	282	-	133,493
48. Cnel Suarez	1959	Not in operation		-	-	-	-	-	-	-	-	-	-	-	N.O.P.
	1960	9,700	-	311	311	-	-	-	-	50	260	-	-	-	32,368
	1961		4,003	4,440	8,443	-	-	-	-	1,067	7,080	-	-	-	2,298,663

(Table continued)

ARGENTINA

CAPACITY AND OPERATING VOLUME OF OFFICIAL COUNTRY ELEVATORS, 1959-1961

LOCATION AND YEAR		TONS OF STORAGE CAPACITY	RECEIPTS			DIRECT TRANSFER			SHIPMENTS			CONDITIONING				TON DAYS STORAGE
			BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	BAGS	BULK	TOTAL	TURNING	DRYING	CLEANING	OTHERS	
46. S. F. De Belloc	1959	5,300	Not in operation			-	-	-	-	-	-	-	-	-	-	N. O. P.
	1960		874	1,885	2,759	-	78	78	42	2,595		-	-	374	-	388,393
	1961		248	3,285	3,533	-	267	267	14	2,807		1,108	-	354	-	515,449
Total	1959	258,940	182,993	196,166	379,159	1,597	9,250	10,847	4,942	363,988		150,341	24,123	191,714	150	31,668,208
	1960		164,431	187,427	351,858	1,936	7,507	9,443	13,551	303,929		323,558	70,321	77,659	12	49,066,366
	1961		71,663	75,152	146,815	1,321	7,436	8,757	10,464	210,598		103,825	13,509	38,004	-	24,108,669

BOLIVIA

Storage facilities in Bolivia are basically controlled by business firms. The exception is 26,700 M.T. of silo storage with drying facilities being constructed at Santa Cruz by the Government Rice Agency, ENA. Government agencies and cooperatives lease grain product warehouse storage as needed, although presently it is mainly for milled rice storage.

Ministry of Agriculture (MAG) has not compiled an estimate of on-farm and off-farm grain storage capacity in Bolivia. Until this is done, only figures made available by industry groups serve to provide estimates of locations and capacities of grain storage facilities.

WHEAT: Wheat storage facilities are located at the flour mills in 7 locations. Total capacity is estimated at 37,500 M.T. About 30,000 M.T. is warehouse type with the remainder, bulk storage.

CORN: The only known storage capacity for corn is at the cooperative, San Jose Obrero, which has 5 silos of about 260 M.T. each for a total of 1,300 M.T.

BARLEY: Storage of barley is primarily at the breweries. Estimated total storage capacity of the Bolivian breweries is 7,500 M.T. of warehouse type storage.

RICE: Rice storage will be located at Buena Vista and Santa Cruz. It will consist of 26,700 M.T. of silos with drying equipment. The facility is expected to be completed by March 1974.

Other rice storage is located at rice mills. It was estimated at 20 days operating capacity or a total of 7,500 M.T. of warehouse type.

SOYBEANS: The Guzman plant in Cochabamba has adobe walls, tin roof, flat storage of about 1,000 M.T.

GRAIN STORAGE CAPACITIES-BOLIVIA[1)]

Ownership	Location	Type of Grain Stored	Capacity in Metric Tons Bulk	Warehouse
ENA (Government Rice Agency)	Santa Cruz	Rice	26,700	--
Commercial Mills	La Paz (3) Cochabamba (2) Oruro (2) Potosi (1) Sucre (1) Tarija (2) Santa Cruz (1)	Wheat	7,500	30,000
Cooperative	San Jose Obrero	Corn	1,300	--
Commercial Breweries	Various	Barley	--	7,500
Commercial Rice Mills	Various	Rice	--	7,500
Soy Processing	Cochabamba	Soybeans	--	1,000
Total Estimated Storage Capacity			35,500	46,000

1) Pfost, H.B. and F.F. Niernberger, 1973, "Study of Grain Storage and Marketing in Bolivia" Food Grain Drying, Storage, Handling and Transportation. Report No. 42, Food and Feed Grain Institute, Kansas State University.

BRAZIL

Data for silo and warehouse storage capacities are included from two sources. Overall storage for the country as shown in the accompanying table does not necessarily reflect "grain storage" entirely. It should be pointed out that much of the storage is not used or available for cereal products. A number of other agricultural products, primarily coffee (3 million tons), plus non-agricultural and industrial products are also stored in the warehouses.

Additional data is presented for northeast Brazil. There are some obvious discrepancies between the two sets of data for northeast Brazil even though data were presumably collected at about the same time (1961-62). A map shows the location of storage facilities in northeast Brazil.

Farm storage data are not included here. In 1965 a campaign was started in south-western Brazil to encourage the erection of about 50,000 wire-netting cribs (7-8 tons capacity) for storage of maize grown by small producers. This type of storage has not proven entirely satisfactory because of losses due to insects even when grain is treated with pesticides.

In northeast Brazil small capacity metal cylinders were subsidized by the government for farm storage. Approximately 8-16 bushels of grain are stored in these units and their construction makes them virtually

airtight units. No information on the success or failure of these units is available.[1)]

Recent correspondence has indicated that Companhia Brasileira de Armazenamento (CIBRAZEM) has undertaken a full census on storage capacity in Brazil with a target date for completion in March 1975.[2)]

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1) Tolle, Dwight S. Tolle, (1970) Cereal and Dry Edible Bean Marketing and Warehousing in the States of Piaui and Paraiba, Brazil. Food Grain Drying, Storage, Handling and Transportation Report No. 17, Food and Feed Grain Institute, Kansas State University.

2) Personal communication, U.S. Agricultural Attaché, February 5, 1975.

ESTIMATED TOTAL AND GOVERNMENT STORAGE IN BRAZIL
(Thousands of Tons)

	Estimated Total Storage Capacity			Estimated Government [a] Storage Capacity			Private Storage Capacity		
	Silos	Warehouses	Total	Silos	Warehouses	Total	Silos	Warehouses	Total
Rondonia	-	9.3	9.3	-	-	-	-	9.3	9.3
Acre	-	-	-	-	-	-	-	-	-
Amazonas	-	64.1	64.1	-	-	-	-	64.1	64.1
Rio Branco	-	-	-	-	-	-	-	-	-
Para	11.4	510.9	522.3	-	-	-	11.4	510.9	522.3
Amapa	-	34.3	34.3	-	-	-	-	34.3	34.3
Maranhao	-	133.0	133.0	-	-	-	-	133.0	133.0
Piaui	-	12.0	12.0	-	12.0	12.0	-	-	-
Ceara	b	158.8	158.8	-	27.0	27.0	b	131.8	131.8
Rio Grande do Norte	-	92.8	92.8	-	20.0	20.0	-	72.8	72.8
Paraiba	-	4.0	4.0	-	4.0	4.0	-	-	-
Pernambuco	45.8	387.5	433.3	32.0	46.0	78.0	13.8	341.5	355.3
Alagoas	2.7	1,106.6	1,109.3	-	11.0	11.0	2.7	1,095.6	1,098.3
Sergipe	1.8	400.6	402.4	-	19.0	19.0	1.8	381.6	383.4
Bahia	18.9	1,153.9	1,172.8	1.0	24.5	25.5	17.9	1,129.4	1,147.3
Minas Gerais	8.4	3,330.3	3,338.7	-	156.0	156.0	8.4	3,174.3	3,182.7
Espirito Santo	-	824.3	824.3	-	204.0	204.0	-	620.3	620.3
Rio de Janeior	21.6	1,069.8	1,091.4	-	-	-	21.6	1,069.8	1,091.4
Guanabara	86.0	2,971.9	3,057.9	-	1,049.0	1,049.0	86.0	1,922.9	2,008.9
Sao Paulo	234.3	26,217.1	26,451.4	65.0	3,404.0	3,469.0	169.3	22,813.1	22,982.4
Parana	8.8	12,379.9	12,388.7	-	2,060.0	2,060.0	8.8	10,319.9	10,328.7
Santa Catarina	40.8	1,313.8	1,354.6	30.5	34.0	64.5 [c]	10.3	1,279.8	1,290.1
Rio Grande do Sul	261.1	12,116.8	12,377.9	110.0 [c]	222.0 [c]	332.0	151.1	11,894.8	12,045.9
Mato Grosso	.6	712.5	713.1	-	7.0	7.0	.6	705.5	706.1
Goias & Distrito Federal	28.0	1,974.8	2,002.8	28.0	151.0	179.0	-	1,726.8	1,726.8
TOTAL	770.2	66,979.0	67,749.2	266.5	7,450.5	7,717.0	503.7	59,431.5	59,935.2

[a] Including ownership and operation of warehouses by Federal Railway System and National Coffee Institute.
[b] Unknown.
[c] Incomplete.

REFERENCE: "Marketing Facilities for Grain and Tuberous Crops -- Brazil" (1963). Economic and Engineering Study, Weitz-Hettelsater Engineers, Volume I.

Storage Facilities

SUDENE reports (§) that there are in the Northeast at present, completed or about to be completed, 34 units for storage with a capacity of some 134,000 tons. These units, financed by the government, are located in the food producing areas. The priority program for new construction, which SUDENE reports is at the moment limited to warehouses, raises the total units to 90 and the total capacity to 415 thousand tons so that the minimum needs of each state can be met as follows:

State	No. of Units	Capacity in Tons
Maranhão	6	46,000
Piauí	8	29,000 1/
Ceará	10	49,000 1/
Rio Grande do Norte	6	40,000 1/
Paraíba	10	52,000 1/
Pernambuco	11	66,000 2/
Alagoas	8 3/	26,000 1/
Sergipe	6	13,000 1/
Bahia	25	94,000 4/

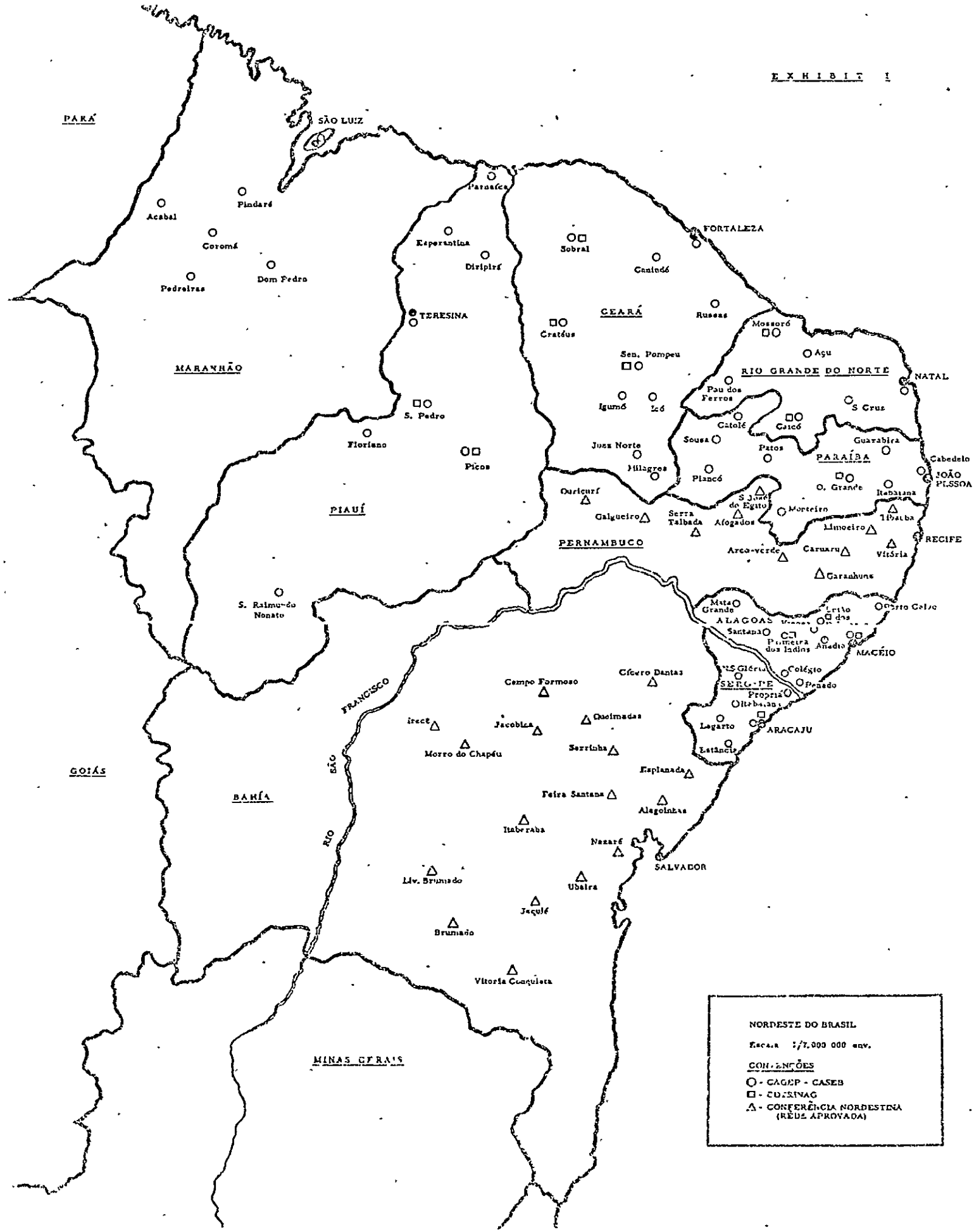
1/ additional storage amounting to a total of 45,000 tons completed of about to be completed at these 6 locations.
2/ all units already completed.
3/ the two units which have been provided for, were consolidated in one thus lowering the total from ten to eight.
4/ total storage capacity for 23,000 tons completed to date.

The maps in Exhibit I show the location of the storage facilities in N.E. Brazil with the exception of Bahia where 17 locations are shown instead of 25.

SUDENE = Superintendency for the Development of the Northeast.

REFERENCE: Holman, L. E. (1961) "Survey and Appraisal of Grain Conditioning, Storage and Handling Facilities in Northeast Brazil." USOM to Brazil (Point IV) Food and Agriculture Division. July, 1961.

EXHIBIT 1


PARÁ
SÃO LUIZ
Parnaíba
Acabal
Pindaré
Coromá
Pedreiras
Dom Pedro
Esperantina
Piripiri
Sobral
Canindé
FORTALEZA
TERESINA
CEARÁ
Russas
Crateús
Mossoró
Açu
Sen. Pompeu
MARANHÃO
RIO GRANDE DO NORTE
NATAL
Pau dos Ferros
Igumó
Icó
S Cruz
Catolé
Caicó
S. Pedro
Floriano
Sousa
Patos
Guarabira
Juaz Norte
PARAÍBA
Cabedelo
Picos
Hilagres
Piancó
JOÃO PESSOA
O. Grande
Rebaiana
Ouricurí
S José do Egito
Monteiro
PIAUÍ
Galgueiro
Serra Talhada
Afogados
Ibiaba
Limoeiro
PERNAMBUCO
RECIFE
Arco-verde
Caruaru
Vitória
Garanhuns
S. Raimundo Nonato
Mata Grande
Leito dos
Ouro Preto
ALAGOAS
Santana
Palmeira dos Indios
Anadia
MACÉIO
Glória
Colégio
Campo Formoso
Cícero Dantas
SERGIPE
Penedo
Propriá
Itabaiana
Irecê
Jacobina
Queimadas
Lagarto
ARACAJU
Morro do Chapéu
Serrinha
Estância
GOIÁS
Esplanada
BAHIA
Feira Santana
Alagoinhas
Itaberaba
Nazaré
SALVADOR
Liv. Brumado
Ubaira
Jaçuípe
Brumado
Vitoria Conquista
MINAS GERAIS
NORDESTE DO BRASIL
Escala 1/7.000 000 aprox.
CONVENÇÕES
O - CAGEP - CASEB
□ - CURSINAG
△ - CONFERÊNCIA NORDESTINA (RÊDE APROVADA)

CHILE

No data are available on farm storage of grains in Chile. The accompanying tables include the location and storage capacities for commercial wheat mills and that belonging to EMPRESA de COMERCIO AGRICOLA (ECA), the government organization responsible for wheat imports and marketing in Chile.[1)]

[1)] Personal Communication, U. S. Agricultural Attaché, February 20, 1975.

CHILE

Silos and Warehouses of Empresa De Comercio Agricola

Location	Type of Storage Warehouse	Silo	Bulk Receiving Capacity (M.T./Day)	Storage Capacity (M.T.)
Bió Bió				
Los Angeles		X	400	6,000
Mulchen		X	400	6,000
Cautín				
Lautaro		X	400	11,500
Loncoche	X		-	2,000
Pitrufquen	X		-	4,000
Temuco		X	400	16,500
Colchagua				
San Fernando		X	400	6,000
Linares				
Linares	X		-	5,000
Llanquihue				
Fresia	X		-	1,500
Llanquihue	X		-	3,500
Puerto Montt.		X	800	12,000
Malleco				
Ercilla	X		-	1,500
Victoria		X	400	6,000
Ñuble				
Chillan		X	400	11,000
Yungay		X	2,000	20,000
O'Higgins				
San Vicente	X		-	4,000
Osorno				
Osorno		X	100	7,000
Talca				
Talca		X	400	6,000
Valdivia				
Los Lagos		X	400	4,000
Unknown Provinces				
Corte Alto	X		-	3,000
Imperial	X		-	4,000
Las Hortensias	X		-	2,000
Malloco		X	-	23,000
Mariquina	X		-	2,500
Perquenco	X		-	2,000
Pillanlelbun	X		-	2,000
San Pedro		X	-	16,000
Vilcun	X		-	2,000
			Total Storage Capacity	190,400

SOURCE: Study by Senor Hernan Undurraga, Jan. 21, 1972, Empresa De Comercio Agricola, Depto. Cereales, Seccion Trigo, May 7, 1973.

CHILE

BULK GRAIN STORAGE CAPACITY AT COMMERCIAL WHEAT MILLS[1)]

Province	No. of Mills	Bulk Receiving Capacity (M.T./Day)	Bulk Storage Capacity (M.T.)
Aconcagua	8	1,150	22,800
Antofagasta	1	1,000	15,000
Arauco	1	100	4,500
Bío Bío	3	--	18,000
Cautín	18	570	40,900
Colchagua	3	500	18,400
Concepción	3	450	23,800
Coquimbo	3	1,850	16,700
Curicó	4	800	21,500
Linares	6	450	27,200
Llanquihue	5	--	16,100
Magallanes	1	600	3,300
Malleco	5	450	29,300
Maule	1	50	3,700
Ñuble	12	600	50,950
O'Higgins	6	1,350	57,500
Osorno	9	250	31,100
Santiago	16[2)]	5,765	181,100
Talca	3	1,800	22,500
Tarapaca	1	1,800	-- 3)
Valdivia	10	600	49,500
Total	124	20,885	690,250

1) Source of Data: Empresa De Comercio Agricola, Depto. Cereales, Seccion Trigo, April 30, 1973.

2) Includes two processors of white wheat (Candealeros).

3) 10,000 M.T. uncovered storage capacity on concrete.

COLOMBIA

No data on farm storage facilities or capacities are presented here.

Likewise information on capacity of grain elevators owned by flour mills, feed mills and breweries is not included here.

There are two government corporations which have responsibility for storage of grain--IDEMA and INAGRARIO. Data presented in the accompanying tables is for storage facilities operated by IDEMA. Comparable information for INAGRARIO is not included.

The Superintendencia Bancaria (Bogota) has indicated that there are over 2,000 private general warehouses in Colombia with a total storage area of 2,462,119 square meters and a volume of 12,530,127 cubic meters. The total capacity of these warehouses, if utilized for grain storage, would be approximately 6,300,000 metric tons, however, the amount of private general warehouse space actually used for grain storage is not known.[1)]

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1) Personal correspondence, Superintendencia Bancaria (Bogota) to U.S. Agricultural Attaché, Bogota, June 9, 1975.

COLOMBIA

STORAGE CAPACITY OF THE SILOS AND WAREHOUSES OWNED BY THE INSTITUTE

CITIES	WAREHOUSES		SILOS		TOTAL
	m^3	Tons[1]	m^3	Tons[2]	TONS
Aguazpl	1,920	2,400	--	--	2,400
Annenia	1,920	2,400	--	--	2,400
Barranquilla	3,840	4,800	--	--	4,800
Barmocabermeja	3,840	4,800	--	--	4,800
Buearamanga	1,000	1,250	--	--	1,250
Buga	3,641	4,551	6,018	4,212	8,763
Bogota, D.E.	640	800	--	--	800
Buenaventura	3,840	4,800	--	--	4,800
Cartagena	4,568	5,710	--	--	5,710
Cartago	1,561	1,951	3,750	2,625	4,676
Codazzi	538	673	3,500	2,450	3,123
Cucuta	3,840	4,800	--	--	4,800
Envigado	3,840	4,800	--	--	4,800
El Banco	3,840	4,800	--	--	4,800
El Espinal	4,441	5,551	6,250	4,375	9,928
Florencia	5,290	6,613	11,814	9,686	16,299
Fontibon	9,600	12,000	5,744	4,021	16,021
Fundacion	2,487	3,109	5,000	3,500	6,609
Gamarra	1,000	1,250	21,953	18,000	19,250
Girardot	1,206	1,508	--	--	1,508
Granada	1,920	2,400	--	--	2,400
Guapi	62	78	--	--	78
La Dorada	4,441	5,551	3,750	2,625	8,176
Leticia	700	875	--	--	875
Magangue	743	929	1,250	875	1,804
Manizales	3,840	4,800	--	--	4,800
Medellin	932	1,165	--	--	1,165
Monteria (Cerete)	1,278	1,598	3,750	2,625	4,223
Neiva	4,590	5,738	--	--	5,738
Paimira	3,840	4,800	--	--	4,800
Pasto	1,920	2,400	10,584	7,409	9,809
Pitalito	1,000	1,250	--	--	1,250
Popayan	470	588	--	--	588
Puerto Lopez	2,920	3,650	--	--	3,650
Riohacha	1,000	1,250	--	--	1,250
Sn. Jose del Guaviare	1,920	2,400	--	--	2,400
San Juan de Arama	800	1,000	--	--	1,000
San Martin	1,920	2,400	--	--	2,400
San Pablo	1,920	2,400	--	--	2,400
Sincelejo	6,720	8,400	--	--	8,400
Tulua	3,840	4,800	--	--	4,800
Tunja	4,634	5,793	1,250	875	6,668
Turbo	900	1,125	--	--	1,125
Villavincencio	7,680	9,600	--	--	
Yumbo	5,000	6,250	--	--	6,250
TOTAL	127,842	159,806	84,613	63,278	223,084

NOTE: The following factors were used to calculate the tonnage: $0.7m^3 = 1\ Ton^1$
This data corresponds to December, 1969. $1.25m^3 = 1\ Ton^2$

Reference: "IDEMA, Instituto de Mercadeo Agropecuario, Produccion, Mercadeo, Precios, Almacenamiento, Treatamiento y Comercio Exterior de Productos Agropecuarios," 1959-69 Colombia.

DOMINICAN REPUBLIC

No data on farm or commercial storage is presented here. Farm storage is probably insignificant in that paddy rice is generally sold directly to the rice mills from the field. Some maize may be stored on farms.

Data presented in the accompanying table reflects storage facilities controlled by the government. Storage warehouses indicated as "under construction" are believed to have been completed. Whether or not the total number of facilities projected were completed is not known. Since data in the accompanying table were published at least three bulk storage silos operated by the Ministry of Agriculture have been completed at the following locations:

Location	Capacity
La Vega	11,300 M.T.
Santiago	6,800 M.T.
San Juan	6,800 M.T.

DOMINICAN REPUBLIC

STORAGE PLAN FOR PRICE STABILIZATION
OF AGRICULTURAL PRODUCTS

Location	Warehouses Under Construction No.	Capacity	Projected No.	Capacity
		Quintals		Quintals
National District	4	120,000	21	630,000
La Vega	2	60,000	6	180,000
Santiago	4	120,000	12	360,000
San Fco. de Macoria	--	---	2	60,000
Nagua	--	---	1	30,000
Puerto Plata	2	60,000	2	60,000
Monte Cristi	1	30,000	2	60,000
San Juan	4	120,000	6	180,000
Barahona	1	30,000	2	60,000
Bani	1	30,000	1	30,000
San Pedro de Macoris	1	30,000	1	30,000
Padre Las Casas	--	---	1	10,000
Azua	--	---	1	10,000
TOTAL	20	600,000	58	1,700,000

Reference: Williams, N. H. (1965), "Survey of Grain Storage and Handling Methods in Dominican Republic." Report Prepared for USAID/Santo Domingo, Banco Agricola and Ministry of Agriculture, Dominican Republic.

ECUADOR

No data for farm storage or total grain storage for Ecuador are presented here.

Rice mill storage capacities are shown in data presented here. Storage at rice mills usually consists of two general types: (1) open shelters constructed of bamboo with bamboo mats for floors or (2) concrete rectangular bins under wood or thatched roofs.

ECUADOR

Capacity for Storage of Rice at Mills, in Ecuador, National, Selected Provincial and Cantonal Levels, 1968

		Storage Capacity in Metric Tons	
I.	National Totals Number of Piladoras - 99 Number of Molinos - 489.		88,181.63
II.	Provincial and Cantonal Totals:		
	A. Guayas Province:		71,419.39
	1. Canton Guayaquil	18,134.34	
	2. Canton Samborodon	10,827.04	
	3. Canton Yaguachi	10,644.82	
	4. Canton Milagro	17,743.40	
	5. Canton Daule	7,859.31	
	6. Canton Balzar	3,269.33	
	7. Canton Urvina Jado	2,279.76	
	8. Canton Noranjal	661.60	
	B. Los Rios Province		14,588.93
	1. Canton Babahoyo	8,335.59	
	2. Canton Vinces	1,995.07	
	3. Canton Puebloviejo	581.34	
	4. Canton Baba	708.97	
	5. Canton Quevedo	1,031.06	
	6. Canton Urdaneta	838.63	
	7. Canton Ventanas	1,098.28	
	C. Manabi Province		788.50
	D. El Oro Province		147.86
	E. Bolivar Province		68.17
	F. Canar Province		53.71
	G. Pichincha Province		95.75
	H. Loja Province		19.32

Source: Data from "Estudio Preliminar Sobre Almacenamiento de Granos en el Ecuador" Secretaria General de Planeacion Economica de la Junta Nactional de Planification y Coordinacion, Documento No. 06-03, 16-IX-68

Reference: Sorenson, L.O., 1970, "A Review of Rice Drying and Storage Problems in Ecuador" Food Grain Drying, Storage, Handling and Transportation Report No. 16, Food and Feed Grain Institute, Kansas State University.

EL SALVADOR

No data is available on farm or commercial storage facilities or capacities.

Capacity of government storage under control of Instituto Regulador de Abastecimientos, Caja de Credito, Banco Hipotecario, and others are shown in the accompanying tables.

EL SALVADOR

A LIST OF STORAGE FACILITIES FOR GRAIN IN EL SALVADOR

Institution	Type of Ownership	Location	Capacity	Institution Sub-Total	Western Zone	Central Zone	Eastern Zone
				(Quintales)			
Instituto Regulador	Own	San Martin	675.500			675.500	
de Abastecimientos	Own	Santiago Nonualco	15.000			15.000	
	Rent	Soyapango	50.000			50.000	
	Rent	Matazano 1/	60.000			60.000	
	Rent	Motel Royal	80.000			80.000	
	Rent	Guayabal	70.000			70.000	
	Own	Usulutan	120.000				120.000
	Rent	Cooperative	130.000				130.000
	Rent	Santa Ana	10.000		10.000		
	Rent	Ortiz & Cia (Sta. Ana)	72.000	1.282.500	72.000		
Cajas de Credito	Own	Varios	42.000	42.000		42.000	
Banco Hipotecario	Own	San Miguel	226.000	226.000			226.000
ALIANSA	Own	San Salvador	322.000	322.000		322.000	
FAMOSA	Own	San Salvador	322.000	322.000		322.000	
ALCASA	Own	Acajutla	802.000	802.000	802.000		
T O T A L			2.996.500	2.996.500	884.000	1.636.500	476.000

1/ Only rented when required for storage of milled rice for export.

SOURCE: Planification Department I. R. A.

CAPACITIES OF SILOS AND WAREHOUSES OF SECTIONS OF THE INSTITUTE FOR REGULATION OF SUPPLIES

(In Quintales)

Storage Plant No. 1:	No. of Units	Capacity/Unit	Total Capacity	Occupied Capacity	Capacity Available
Silos	# 18	10,000.00	180,000.00	----	180,000.00
Silos	16	5,000.00	80,000.00	15,000.00	65,000.00
Silos	7	2,500.00	17,500.00	7,500.00	10,000.00
Warehouses	1	80,000.00	80,000.00	80,000.00	----
Warehouses	2	40,000.00	80,000.00	80,000.00	----
Sub-total		137,500.00	437,500.000	182,500.00	255,000.00
Storage Plant No. 2:					
Silos	# 6	7,000.00	42,000.00	9,500.00	32,500.00
Plant Warehouse	2	39,000.00	78,000.00	78,000.00	----
Cotton Warehouse Cooperative ...	1	28,000.00	28,000.00	10,000.00	18,000.00
Cotton Warehouse Cooperative ...	2	30,000.00	30,000.00	30,000.00	----
Cotton Warehouse Cooperative ...	3	31,000.00	31,000.00	6,000.00	25,000.00
Cotton Warehouse Cooperative ...	4	26,000.00	26,000.00	26,000.00	----
Cotton Warehouse Cooperative ...	7	72,000.00	72,000.00	----	----
Cotton Warehouse Cooperative ...	8	40,000.00	40,000.00	30,000.00	10,000.00
Cotton Warehouse Cooperative ...	9	60,000.00	60,000.00	10,000.00	50,000.00
Sub-total		333,000.00	407,000.00	199,500.00	135,500.00
Soyapango Cotton Cooperative:					
Silos	# -	----	----	----	----
Warehouses	2	25,000.00	50,000.00	25,217.12	24,782.88
Sub-total		25,000.00	50,000.00	25,217.12	24,782.88
El Coro Warehouses:					
Silos	# 30	1,000.00	30,000.00	26,000.00	4,000.00
Warehouses	-	----	----	----	----
Sub-total		1,000.00	30,000.00	26,000.00	4,000.00

Santa Ana Warehouse:	No. of Units	Capacity/Unit	Total Capacity	Occupied Capacity	Capacity Available
Silos	# -	----	----	----	----
Warehouses	1	9,000.00	9,000.00	7,700.00	1,300.00
Sub-total		9,000.00	9,000.00	7,700.00	1,300.00
El Matazano Warehouse:					
Silos	-	----	----	----	----
Warehouses	1	45,000.00	45,000.00	31,592.12	13,407.88
Sub-total		45,000.00	45,000.00	31,592.12	13,407.88
Morazan Cigarette Warehouse:					
Silos	-	----	----	----	----
Warehouses	1	50,000.00	50,000.00	32,568.75	17,431.25
Sub-total		50,000.00	50,000.00	32.568.75	17,431.25
GENERAL TOTAL		600,500.00	1,028,500.00	505,077.99	451,422.01

---- In Storage Plant No. 1 the warehouses for storage of grain No. 1 as occupied by the Department of Packaging and Distribution and Warehouse No. 3 for materials

---- In Storage Plant No. 2, warehouse No. 7 of the Cotton Co-op is in very poor condition, and cannot be used for grain storage and the remainder of the same coperative have leaks, but not as bad as No. 7. In addition, warehouse No. 9 of the Cotton Co-op in order to be used must have the roof repaired. 39,000 Q. capacity is used for packaging products for suppling authorized agencies.

Mensuration Equivalents: 1 Quintal = 0.1 Metric Ton = 220.462 Pounds

Source: Commercial Department San Salvador October 14, 1969.

GUATEMALA

No data are presented here for farm storage of grain.

Available statistics on existing storage facilities are extremely sketchy. Data available on capacity of bulk storage silos is presented in the accompanying Table 1.

No reliable information is available on the existing warehouse capacity used for storing grain. Data presented in the accompanying Table 2 on warehouse capacity for corn storage are estimates based on amount of corn produced in Guatemala and using a turn-over rate of 3.0.[1)]

An extensive program has been undertaken to expand the storage facilities supervised by the Instituto Nacional de Comercializacion Agricola (INDECA). Recent information,[2)] on capacities and location of the current and soon to be completed INDECA program carried out by the Ministry of Agriculture, is shown in Table 3.

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1) Fletcher, L. B., et al. (1970). "Guatemala's Economic Development: The Tole of Agriculture," Ames: Iowa State University Press, 212 p.

2) Personal communication, U.S. Agricultural Attaché, March 12, 1975.

GUATEMALA

TABLE 1. SUMMARY OF GRAIN SILO CAPACITY BY ZONE

Zone	Department		Capacity (M.T.)
1. Central			19,440
	Guatemala	19,440	
2. Sur			4,445
	Escuintla	783	
	Suchitepequez	2,903	
	Retalhuleu	759	
3. Occidental			833
	San Marcos	28	
	Quezaltenango	805	
4. Ocidental Media			-----
5. Nor Occidental			148
	Huehuetenango	148	
6. Norte			----
7. Nor Oriental			-----
8. Oriental			----
9. Sur Oriental			4,370
	Santa Rosa	1,104	
	Jutiapa	3,266	
TOTAL			29,236

Reference: Fletcher, L. B., et al. (1970). "Guatemala's Economic Development: The Tole of Agriculture", Ames: Iowa State University Press, 212 p.

GUATEMALA

TABLE 2. WAREHOUSE CAPACITY FOR CORN STORAGE

Zone	Percent of Corn Marketed[a]	Warehouse Capacity Estimates[b]
1. Central	65	11,000[c]
2. Sur	80	50,000
3. Occidental	40	13,000
4. Occidental Media	50	4,000
5. Nor Occidental	40	13,000
6. Norte	50	12,000
7. Nor Oriental	50	6,000
8. Oriental	70	10,000
9. Sur Oriental	70	9,000
TOTAL		128,000

a) Data on the percentage of corn marketed in the various zones are not available. These percentages represent assumptions based on discussions with personnel of the Ministry of Agriculture in Guatemala.

b) These figures are rough estimates of capacity needed to store marketed grain within the region if the average turnover rate is equal to 3. Figures for zone 2 take into account grain movement to zone 1.

c) A substantial part of this capacity may in fact be located in Guatemala City.

Reference: Fletcher, L. B., et al. (1970). "Guatemala's Economic Development: The Tole of Agriculture", Ames: Iowa State University Press, 212 p.

TABLE 3. SUMMARY OF EXISTING AND PROPOSED GRAIN STORAGE SILOS AND WAREHOUSES SUPERVISED BY INDECA[1)]

Location	EXISTING CAPACITY			CAPACITY UNDER CONSTRUCTION			Estimated Completion Date
	Silos M.T.	Warehouses M.T.	Total M.T.	Silos M.T.	Warehouses M.T.	Total M.T.	
Guatemala Cent. Silo	11,122	2,567	13,689	6,949		6,949	12/74
Coatepeque	503	532	1,035				
Retalhuleu	503	532	1,035	10,814	1,440	12,254	6/75
La Democracia	503	532	1,035				
Chiquimolio	503	532	1,035				
Jutiapa	503	532	1,035	5,346	1,200	6,546	6/75
Quezaitenango				10,814	1,440	12,254	3/75
Los Amates				5,346	1,200	6,546	3/75
Tactic				3,346	1,200	6,546	9/75
La Maquina				3,243	868	4,111	10/74
Teleman				3,243	868	4,111	12/74
Fray Bartolome				3,243	868	4,111	3/75
Nueva Concepcion				1,621	472	2,093	10/74
Navajoa				1,621	472	2,093	12/74
Montufar				805	323	1,128	12/74
Jaipatagua				805	323	1,128	12/74
Caballo Blanco				455	242	697	8/74
Catarina				455	242	697	8/74
Las Palmas				455	242	697	8/74
Ipala				455	242	697	5/75
Tiucal				455	242	697	5/75
Monjas				455	242	697	4/75
Monterrey				252	149	401	8/74
La Blanca				252	149	401	8/74
Seja				252	149	401	1/75
San Esteban				252	149	401	6/75
TOTALS	13,637	5,227	18,864	62,934	12,722	75,656	

1) Personal communication, U.S. Agricultural Attaché, March 12, 1975.

GUYANA

No data are presented for on-farm or private sector storage. Available information, in general, indicates "untenable" sanitation conditions in paddy storage, rice storage and processing properties.

Construction of paddy storage centers began in late 1970 to have a capacity of 51,800 long tons, sufficient for about 25 percent of the projected crop. Storage for 9,312 long tons of milled rice in 24 bulk bins was scheduled for Georgetown.

According to recent information, the Guyanese Government has recently completed modern facilities for paddy and milled rice. The modern silos with dryers are located in the producing areas and have a total capacity of 30,000 M.T. of paddy rice. The bulk milled rice storage facility has a capacity of 9,200 M.T. and is located near the port of Georgetown.[1)]

A flour mill stores wheat, however, the capacity is unknown.[1)]

[1)] Personal communication, U.S. Agricultural Attaché, February 24, 1975.

HAITI

Data on storage capacities and types are virtually non-existent. Common farm storage methods include:

(1) Portable storage bags made of plaited palm leaves, baskets or 55-gallon oil drums placed in living huts.

(2) Thatched huts built on tall stilts.

(3) Bundles of husk-protected ears of maize suspended by wires or ropes from tree branches.

(4) Thatched roof granaries with walls made of clay mixed with plant material.

USAID/Haiti is presently considering funds to construct 1100 ferro cement "Thailos" of 2-ton capacity for rural storage. Because of farm size (average less than 1 hectare) and crop diversity, a 2-ton bulk storage unit does not seem practical.

Off-farm bulk storage owned by Institut de Development Agricole et Industriel (IDAI) includes:

Location	No. Units	Type	Unit Capacity	Total Cap
		Round		
Les Cayes	7	Corrugated Metal	35 M.T.	245
Miragoane	3	"	"	105
Jacmel	3	"	"	105
Gonaives	3	"	"	105
Mirebalais	1	"	"	35
		TOTAL CAPACITY	595 M.T.	

Reference: Sorenson, L.O., and D.S. Chung, 1973, "Grain Marketing and Market System Development in Haiti," Food Grain Drying, Storage, Handling and Transportation Report No. 43, Food and Feed Grain Institute, Kansas State University.

HONDURAS

We have no information on farm storage capacities or methods in Honduras.

Data presented here indicate capacities for storage controlled by Banco Nacional de Fomento and does not include capacities for commercial or cooperative organizations.

HONDURAS

NATIONAL DEVELOPMENT BANKS
DIVISION OF CEREALS

LOCATION AND CAPACITY OF STORAGE

DEPARTMENT	STORAGE CENTERS		(100/Q1)
Fco. Morazan	Tegucigalpa		
	Cerro de Hule		50,000.00
	Terminal Kennedy:		
	Warehouses	20,900.00	
	Silos	293,700.00	314,600.00
	Miraflores		100,000.00
Choluteca	Choluteca		15,000.00
Comayagua	Comayagua		25,600.00
Olancho	Juticalpa		10,400.00
	Catacamas		5,500.00
El Paraiso	Danli		14,600.00
Fco. Morazan	El Porvenir		6,600.00
Cortes	San Pedro Sula Terminal:		
	Warehouses	20,900.00	
	Silos	293,700.00	314,600.00
	Graneros:		
	Warehouse	20,000.00	
	Silos	40,000.00	60,000.00
	Puerto Cortes		15,000.00
Atlantida	Tela		13,700.00
Copan	La Entrada		6,600.00
Sta. Barbara	Quimistan		6,600.00
Yoro	El Negrito		6,600.00
	Olanchito		10,400.00
Cortes	Cuyamel		6,100.00
Choluteca	El Triunfo		6,600.00
	TOTAL STORAGE CAPACITY----------		989,200.00

Mensuration Equivalent: 1 Quintal = 0.1 Metric Ton = 200.462 Pounds

Reference: Banco Nacional de tomento, Division de Cereales

MEXICO

It is estimated that approximately 80 percent of the off-farm grain storage capacity in Mexico is owned and controlled by the government agency, Almacenes Nacionales de Deposito, S. A. (ANDSA). The remaining 20 percent of the country's commercial scale storage capacity is privately owned.

Much grain is obviously stored on-farm in small quantities, however, no data are available on total quantities.

Total capacity of ANDSA is reported as 3.7 million metric tons. Location and capacities of ANDSA storage facilities are indicated in the accompanying table. There are 646 warehouses in the ANDSA system. Total commercial capacity is estimated at 4.6 million metric tons for Mexico but there is no estimate of the number of private facilities.[1)]

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1) Personal communication, U. S. Assistant Agricultural Attaché, March 6, 1975.

CAPACITY OF GRAIN STORAGE FACILITIES
ALMACENES NACIONALES DE DEPOSITO, S.A.

DIRECTORIO DE BODEGAS PROPIAS

October 1974

State and City	Area (m^2)	Capacity (M.T.)
AGUASCALIENTES		
Aguascalientes	7,899	27,100
Pabellon	1,210	5,000
TOTAL	9,209	32,100
BAJA CALIFORNIA NORTE		
Ensenada	731	1,500
Mexicali	12,186	75,000
Tecate	2,620	10,000
Tajuana	1,584	5,000
TOTAL	17,121	91,500
BAJA CALIFORNIA SUR		
La Paz	3,168	10,000
TOTAL	3,168	10,000
CAMPECHE		
Campeche	1,440	2,900
Hopelchén	1,440	3,600
TOTAL	2,880	6,500
CHIAPAS		
Arriaga	16,707	50,870
Cintalpa	1,619	5,070
Col. 20 de Noviembre	1,440	4,000
Comitán	1,618	5,045
Chamic	2,520	7,000
Chiapa de Corzo	1,619	5,050
Flores Magón	1,584	5,000
Huixtla	1,584	5,000

Continued

State and City	Area (m^2)	Capacity (M.T.)
CHIAPAS (Con't.)		
Jiquipilas	1,440	3,600
La Garza	1,584	5,000
Melchor Ocampo	1,584	5,000
Ocozocuautla	1,624	5,065
San Cristóbal las Casas	1,584	5,000
San Pedro Buenavista	1,440	4,000
Tapachula	3,485	9,400
Tuxtla Gutiérrez	4,313	15,000
Venustiano Carranza	1,518	4,200
Villa de Acala	1,460	4,080
Villa Flores	2,784	10,800
TOTAL	51,507	158,180
CHIHUAHUA		
Cd. Cuahtémoc	1,148	2,890
Cd. Delicias	20,386	55,290
Cd. Jimenez	1,584	5,000
Cd. Juárez	1,584	5,000
Chihuahua	5,240	20,000
Estación Babicora	1,818	4,580
Nuevo Casas Grandes	1,584	5,000
San José Babicora	484	1,200
Santa Ana	458	1,150
Tejolocachic	1,804	4,550
TOTAL	36,090	104,660
COAHUILA		
Sabinas	354	1,000
Saltillo	36,092	124,610
San Carlos	200	420
Torreón	33,314	81,760
TOTAL	69,960	207,790
COLIMA		
Colima	3,390	6,870
Manzanillo	1,050	2,350
TOTAL	4,440	9,220
DISTRITO FEDERAL		
Azcapotzalco	231,164	693,340
Villa Alvaro Obregón	5,280	17,500
TOTAL	236,444	710,840

Continued

State and City	Area (m^2)	Capacity (M.T.)
DURANGO		
Durango	9,217	30,500
Gómez Palacio	7,920	25,000
Gvadalvpe Victoria	1,200	2,800
Vicente Guerrero	1,584	5,000
TOTAL	19,921	63,300
GUANAJVATO		
Acámbaro	1,208	3,380
Celaya	5,488	21,370
Cortazar	1,584	5,000
Irapuato	25,848	78,880
Jaral del Progreso	680	1,720
León	3,168	10,000
Pénjamo	1,500	4,200
Salvatierra	1,584	5,000
San Miguel Allende	546	1,400
Valle de Santiago	648	1,800
TOTAL	42,254	132,750
GUERRERC		
Acapulco	4,752	15,000
Chilpancingo	1,584	5,000
Inguala	6,336	20,000
TOTAL	12,672	40,000
HIDALGO		
Atotonilco	1,046	1,700
Pachuca	1,584	5,000
Teocalco	2,400	6,700
Tulancingo	1,044	3,000
TOTAL	6,074	16,400
JALISCO		
Ameca	1,440	2,450
Autlan	6,336	20,000
Cd. Guzman	13,293	43,460
El Grullo	6,336	20,000
Etzatlan	1,127	4,540
Guadalajara	78,836	254,480
Jamay	1,058	2,960
La Huerta	7,920	25,000
Puerto Vallarta	1,448	4,050
Union de Tula	1,220	2,730
Zapotiltic	2,600	7,840
TOTAL	121,614	387,510

Continued

State and City	Area (m^2)	Capacity (M.T.)
MEXICO		
Atlacomulco	1,082	5,800
Ixtlahuaca	1,235	6,500
Lerma	20,387	58,300
Tlalnepantla	3,642	101,400
Toluca	13,833	46,100
Villa Victoria	1,200	3,800
TOTAL	41,339	221,900
MICHOACAN		
Apatzingám	1,440	3,600
Jiquilpam	1,200	3,360
La Piedad	3,168	10,000
Maravatío	1,200	3,300
Morelia	11,450	36,935
Pátzcuaro	963	2,700
Villa Jimènez	1,200	3,000
Zacapu	2,400	7,600
Zamora	3,312	6,800
Zitácuaro	600	1,700
TOTAL	26,933	78,995
MORELOS		
Cuermavaca	4,752	13,400
TOTAL	4,752	13,400
NAYARIT		
Acaponeta	3,632	10,100
Compostela	3,632	10,100
Namche	4,364	9,750
Ruiz	3,630	5,900
TOTAL	15,258	48,050
NUEVO LEON		
Cadereyta Jimemez	1,062	2,950
El Potosi	800	2,250
Monterry	11,929	35,750
TOTAL	13,791	40,950

Continued

State and City	Area (m^2)	Capacity (M.T.)
OAXACA		
Oaxaca	4,652	14,075
Tehuantepec	1,616	5,055
TOTAL	6,268	19,130
PUEBLA		
Esperanza	1,032	4,000
Pochintoc	1,070	3,000
Puebla	8,661	29,780
San Martin Texmelucan	815	2,180
Tecamachalco	1,061	2,900
Tehuacán	1,584	5,000
Villa R.L. Grajales	1,554	3,100
TOTAL	15,777	49,960
QUERETARO		
Querétaro	5,585	17,800
San Juan del Rio	1,121	2,800
TOTAL	6,706	20,600
SAN LUIS POTOSI		
Rio Verde	1,800	4,000
San Luis Potosí	8,961	26,670
TOTAL	10,761	30,670
SINALOA		
Culiacán	14,070	51,295
El Rosario	1,738	3,300
Guamuchil	6,848	22,580
Guasave	448	1,800
León Finseca	8,650	50,000
Los Mochio	18,197	103,330
Mazatlan	6,336	20,000
Rosales	1,500	4,040
TOTAL	57,787	256,345
SONORA		
Caborca	5,379	30,800
Cd. Obregon	26,870	160,700
Guaymas	168	73,400
Hermesillo	24,534	102,410

Continued

State and City	Area (m^2)	Capacity (M.T.)
SONORA (Con't.)		
Huatabampo	3,788	28,000
Navojoa	13,884	80,300
Vicam	2,753	18,000
TOTAL	57,376	493,610
TABASCO		
Chontalpa	1,656	5,120
Teapa	1,200	3,300
Tenosique	1,649	5,100
TOTAL	4,505	13,520
TAMAULIPAS		
Cd. Camargo	5,100	16,070
Cd. Mante	1,740	3,250
Cd. Ocampo	1,200	3,350
Cd. Victoria	1,440	2,500
Col. Anáhuae	3,219	10,140
Col. Magueyes	7,010	22,100
El Faro	4,579	14,240
Estación Canales	4,140	13,040
Estación Cruz	1,440	2,500
Lucio Olanco	7,678	24,140
Llera	300	600
Matamoros	14,593	36,350
Nuevo Laredo	3,168	10,000
Rio Brauo	11,161	46,540
Valle Hermoso	5,389	17,070
TOTAL	72,097	221,890
TLAXCALA		
Apizaco	9,608	30,175
Huamantla	1,291	4,070
Santa Ana Chiautempan	1,200	4,600
TOTAL	12,099	38,845
VERACRUZ		
Acayucan	2,844	8,200
Estación Rubin	29,904	95,000
J. Rodríquez Clara	1,500	4,200
Martínez de la Torre	1,200	2,750
Peñuela	2,708	7,940

Continued

State and City	Area (m^2)	Capacity (M.T.)
VERACRUZ (Con't.)		
Perote	3,872	8,130
San Andrés Tuxtla	1,440	3,200
Tierra Blanca	850	1,660
Tihuatlán	1,440	2,800
Veracruz	600	1,600
Villa Cardel	804	2,250
TOTAL	45,162	137,760
YUCATAN		
Mérida	7,253	25,400/
Tizimín	1,584	5,000
Valladolid	1,400	4,000
TOTAL	10,277	34,400
ZACATECAS		
Feresorillo	1,584	5,000
Guadalupe	6,444	20,180
Loreto	1,329	3,700
Ojocaliente	623	1,620
Zacatecas	802	2,250
TOTAL	10,782	32,750
GRAND TOTAL	975,420	3,723,525

NICARAGUA

No data is presented here on farm storage types or capacity. Data available on government and commercial grain storage is incomplete and should be considered as estimates.

The National Emergency Committee in July 1973 indicated the storage capacity for basic grains at that time was:

Government Storage	119,000 Metric Tons
Private Sector Storage	86,363
TOTAL	205,363 Metric Tons

More recent information indicates government (INCEI) storage as 152,500 metric tons on December 31, 1974 with an additional 19,500 metric tons possibly under construction.[1] INCEI's storage types and locations are indicated as follows:

	Assumed Bulk Storage	Horizontal Warehouses	Total
Terminal No. 1 Managua	7,000 M.T.	(1) 7,500 M.T.	14,500
Terminal No. 2 Chinandega	12,000	--	17,000
Terminal No. 3 San Isidro	12,000	--	17,000
Location Unknown			
100 units at 24,000 q.q.	120,000	--	120,000
2 Inflatable Warehouses	--	(2) 3,500	3,500
40 Horizontal Warehouses	--	(40)10,000	10,000
TOTAL INCEI STORAGE	151,000	21,000	182,000

[1] Personal Communication, U.S. Agricultural Attaché, Feb. 20, 1975.

PANAMA

Panama's total grain storage capacity in 1970 was 1,876,700 quintals. This includes 321,400 quintals of Government capacity and 1,555,300 quintals of private industry capacity. Of this amount, 85,000 quintals of Government capacity and 130,000 quintals of private industry capacity are silos for storage in bulk. By location in the marketing system, the breakdown of the total storage capacity is as follows:

- Country points, 268,800 quintals
- Terminal points, 1,475,400 quintals
- Distribution warehouses, 132,500 quintals

In 1969-70 the average annual turnover of the country and terminal capacity was 1.49. The average turnover of the distribution capacity was 10.68. It is believed that under conditions in Panama, the average annual turnover capacity can be raised to 2.0 for the country and terminal capacity and 12.0 for the distribution warehouse capacity.

On this basis and the projected marketing volumes, the additional grain storage facilities to be needed by 1979-80 include the following:

Type of Facility	Replacement		Additional	
	Number	Capacity (qq)	Number	Capacity (qq)
Country storage (bags)	18	48,200	34	261,000
Country storage (silo)	-	-	4	90,000
Terminal storage (bags)	10	284,000	5	64,000
Terminal storage (silo)	-	-	10	576,000
Distribution warehouses (bags)	-	-	11	127,000
	28	332,200	64	1,118,000

Additional storage facilities will be needed in all provinces, but the needs will be concentrated in Chiriqui and Cocle where production is growing rapidly, and in Panama where demand is growing most rapidly. Some of the needed expansion should be Government-owned facilities, but the greatest improvement and expansion is needed in the private sector of Panama's grain marketing system.

Reference: Phillips, R. (1973), "Needs and Opportunities for Improved Grain Marketing in Panama, Executive Digest." Food Grain Drying, Storage, Handling and Transportation - Report No. 36, Food and Feed Grain Institute, Kansas State University.

Mensuration Equivalent: 1 Quintal = 0.1 Metric Ton = 220.462 Pounds

PERU

No data is presented here on farm storage types or capacities.

Rice and wheat storage shown in the tables on the following pages, with the exception of the port facilities at Callao and Matarani, would be classified as private storage.

In addition to the rice and wheat storage, several agencies have grain and/or food storage facilities.

1. There is an unknown capacity for storage at one malting plant and two corn processing plants near Lima.

2. Welfare agencies such as CARITAS and OFASA are said to have a warehouse capacity of up to 12,000 M.T.

3. ONAA, the government food distribution agency, is completing a new storage and warehousing facility of approximately 15,000 M.T.

Plans for expanding storage capacity include:

1. A government system for storing rice (capacity unknown).

2. Additional storage of 5,000 M.T. at Matarani Port and 35,000 M.T. at Callao Port. (The October 1974 earthquake has delayed construction of new silos and severely damaged existing ones.)

3. EPSA has plans for building an additional 200,000 M.T. for rice storage.

Source: Personal Communication, U.S. Agricultural Attaché, Feb. 20, 1975.

PERU: Rice Storage Capacity

Location	No. of Mills	Paddy Rice	Milled Rice
		(In Metric Tons)	
Piura	23	115,676	15,940
Lambayeque	21	133,836	10,115
Pacasmayo	24	147,183	28,651
Trujillo	4	12,420	950
Camana	21	9,466	870
Yurimaguas	3	10,320	3,370
Tarapoto	2	1,750	750
Contamana	4	1,330	650
Pucallpa	5	2,550	1,200
Tingo Maria	6	2,450	480
Satipo	1	750	250
Iquitos	7	4,480	2,315
Nauta	3	2,000	525
Jaen-Bagua	13	98,813	10,575
Puerto Maldonado	4	1,185	385
Requena	1	750	250
Moyobamba	1	750	250
	143	545,709	77,526

SOURCE: EPSA

PERU: Wheat Storage Capacity

Location	Mills	Silos	Ground /1	Total
		(In Metric Tons)		
Callao	Santa Rosa	20,000	20,000	40,000
	Peru S. A.	5,871	15,000	20,871
	Nicolini	1,000	25,000	26,000
	Excelsior	13,000	20,000	33,000
Lima	Molitalia S.A.	4,000	9,000	13,000
	Triunfo	100	800	900
Arequipa	Sidsur	10,912	-	10,912
	Valencia	2,500	-	2,500
Trujillo	Inca S.A.	18,000	4,000	22,000
Iquitos	Iquitos S.A.	2,600	1,400	4,000
Cuzco	Barberis	1,000	-	1,000
Total Mills:		78,983	95,200	174,183
Ports				
Callao		27,821	-	27,821
Matarani		10,700	-	10,700
Total Ports:		38,521	-	38,521
Grand Total:		117,504	95,200	212,704

SOURCE: EPSA

/1 Concrete areas for piling grain, sometimes under shelter.

TRINIDAD

There is a total capacity for storage of bulk grain in Trinidad of approximately 27,670 M.T. which is utilized as follows:

FLOUR MILL	
Wheat	14,970 M.T.
GRAIN TERMINALS	
Corn	10,160 M.T.
Soybeans	2,540 M.T.

Facilities for bulk unloading are provided at the terminals for the grains which are imported.[1)]

1) Personal Communication, U.S. Agricultural Attaché, February 24, 1975.

URUGUAY

Data included in the accompanying table indicates location and capacities of grain storage under the Ministry of Agriculture, Technical Working Group on the National Silos Plan.

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1) Personal communication, U.S. Agricultural Attaché, April 7, 1975.

URUGUAY

STORAGE CAPACITY IN METRIC TONS[1)]

Department	SILOS		WAREHOUSES		TOTAL
	Inland	Port	Inland	Port	
Artigas	--	--	4,550	--	4,550
Canelones	--	--	31,000	--	31,000
Cerro Largo	--	--	5,900	--	5,900
Colonia	63,000	--	127,815	11,000	201,815
Duranzo	4,500	--	3,900	--	8,400
Flores	15,800	--	7,100	--	22,900
Florida	2,668	--	17,000	--	19,668
La Valleja	--	--	8,700	--	8,700
Maldonado	--	--	4,450	--	4,450
Montivideo	22,000	--	56,000	10,000	88,000
Paysandu	--	4,000	71,000	4,800	79,800
Rio Negro	25,000	8,500	86,675	5,000	125,175
Rivera	--	--	--	--	--
Rocha	--	--	1,100	--	1,100
San Jose	15,000	--	16,900	--	31,900
Salto	--	--	44,500	--	44,500
Soriano	74,000	--	160,000	--	234,000
Tacuarembo	5,000	--	11,600	--	16,600
Treinta Y Tres	--	--	--	--	--
Totals	226,968	12,500	658,190	30,800	928,458

1) Grupo Tecnico De Trabajo Del Plan Nacional De Silos, March 20, 1975.

VENEZUELA

Data reported in the following tables refers to all types of storage facilities (silos, warehouses and flat storage). The two terminal facilities indicated are used primarily for loading and unloading shipments arriving at ports and might not be considered storage facilities in the strict sense.

In 1974 it was reported that Venezuela had just enough storage capacity to cover all crop production and imports. Wheat, sorghum, soybeans and soybean meal are imported on a month-to-month basis.

ADAGRO, which owns most of all government storage in Venezuela, increased its storage capacity from 447,000 M.T. in 1973 to 493,000 M.T. in 1974. To cover the forecasted increase in crop production in 1975/76, ADAGRO officials expect to increase their storage capacity to 1,041,000 M.T. ADAGRO anticipates a need for 1.81 million M.T. total storage capacity by the end of 1975 and 2.5 million M.T. by the end of 1976 to accomodate expected increases in crop production.[1)]

No data for farm storage capacities or methods are included here.

[1)] Personal communications, U. S. Agricultural Attaché, March 11 and 17, 1975.

STORAGE CAPACITY IN VENEZUELA: BY TYPE OF CROP STORED, 1975

Regions and States	Rice & Corn 4/	Wheat 5/	Animal Feed Ingredients 5/	For Other Ag. Products 6/
	----------	----------	Metric Tons ----------	----------
Western High Plains:				
Portuguesa	89,485			203,195
Barinas	21,100			35,050
Cojedes	5,800			25,353
	116,385			263,598
Central Plains:				
Guarico	68,450			55,720
Apure	7/			7/
	68,450			55,720
Central Region:				
Aragua	79,196	8,000	-	49,684
Miranda	3,620	53,500	-	3,970
Carabobo	134,500	34,000	103,000	-
	217,316	95,500	103,000	53,654
North-East Region:				
Anzoategui	39,720	23,000	27,000	-
Sucre	11,638	4,200	-	-
Monages	13,000	-	-	57,250
	64,358	27,200	27,000	57,250
West Central Region:				
Lara	7,686	-		21,464
Falcon	2,000	-		7,672
Yaracuy	66,490	5,500		17,090
	76,176	5,500		46,226
Andes Region:				
Tachira	12,850			8,470
Merida	8,500			-
Trujillo	12,700			6,500
	34,050			14,970
Zuliance Region:				
Zulia	46,100	34,000	26,500	
	46,100	34,000	26,500	
Guayana Region:				
Bolivar	10,025	4,500		11,225
T.F.D. Amacuro	-	-		2,500
	10,025	4,500		13,725
Capital Region:				
Dto. Federal	61,356	12,000		
	61,356	12,000		
NATIONAL TOTAL	694,216	178,700	156,500	505,143

STORAGE CAPACITY IN VENEZUELA: BY CLASS OF OWNERSHIP, 1975

Regions and States	Capacity of ADAGRO Storage Facilities 1/	Capacity of Private Storage Facilities 2/	Unidentified by type of Ownership 3/	Total Storage Capacity
	Metric Tons			
Western High Plains:				
Portuguesa	150,300	142,380		292,680
Barinas	46,000	10,150		56,150
Cojedes	16,640	14,513		31,153
	212,940	167,043		379,983
Central Plains:				
Guarico	69,300	54,870		124,170
Apure	7/	7/		7/
	69,300	54,870		124,170
Central Region:				
Aragua	50,300	86,580	-	136,880
Miranda	7,590	53,500	-	61,090
Carabobo	17,290 T.S.F.	144,544	109,666	271,500
	75,180	284,624	109,666	469,470
North-East Region:				
Anzoategui	8,088	50,000 8/	31,632	89,720
Sucre	7,690	4,200	3,948	15,838
Monages	58,500	11,750	-	70,250
	74,278	65,950	35,580	175,808
West Central Region:				
Lara	28,600	550		29,150
Falcon	2,000	7,672		9,672
Yaracuy	35,090 T.S.F.	53,990		89,080
	65,690	62,212		127,902
Andes Region:				
Tachira	19,950	1,370	-	21,320
Merida	-	6,000	2,500	8,500
Trujillo	19,200	-	-	19,200
	39,150	7,370	2,500	49,020
Zuliance Region:				
Zulia	12,490	60,500 9/	33,610	106,610
	12,490	60,500	33,610	106,610
Guayana Region:				
Bolivar	22,750	3,000		25,750
T.F.D. Amacuro	2,500	-		2,500
	25,250	3,000		28,250
Capital Region:				
Dto. Federal	-	-	61,356	73,356 10/
			61,356	73,356
NATIONAL TOTAL	574,278	705,569	242,712	1,534,559 10/

T.S.F. = Terminal Storage Facility.

STORAGE CAPACITY IN VENEZUELA

Footnotes:

1/ ADAGRO is government entity responsible for bulk of all government storage facilities.

2/ Estimates of private storage facilities based on ADAGRO data and adjusted as indicated to agree with estimates from private trade sources.

3/ Equal to difference between total rice, corn, wheat, and animal feed ingredient storage minus total storage capacity identified by type of ownership.

4/ Based on Anuario Estadistico Agropecurio, 1973, Ministerio de Agricultura y Cria.

5/ Based on estimates from private trade sources.

6/ Difference between total storage capacity indentified by type of ownership minus total rice, corn, wheat, and animal feed storage.

7/ Apure's crops stored in Guarico.

8/ ADAGRO estimate of 12,132 m.t. increased to 50,000 m.t. to agree with private trades estimate of total wheat and feed ingredient storage capacity under private ownership in State of Anzuategui.

9/ ADAGRO estimate of 18,735 increased to 60,500 m.t., private trade's estimate of total wheat and feed-grain capacity under private ownership in State of Zulia.

10/ Includes 12,000 m.t. of government terminal storage in La Guaira.

NEAR EAST-SOUTH ASIA

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AFGHANISTAN

No data are presented for farm or privately operated storage facilities. Small producers may store grain in pits underground. Larger producers' and merchants' storage usually consists of a room in the home or place of business where bags of grain are stored. Except for grain storage visible in bazaars, very little is known about producer, merchant or private operator storage. Privately owned facilities designed for grain storage are practically non-existent.

Storage facilities maintained by the Food Procurement Department (the government agency responsible for grain storage) are shown in the accompanying table.

AFGHANISTAN: Grain Storage Facilities of Food Procurement Department by Province and Type of Storage (capacity in metric tons)

Region & Province	Silo		Hangar		Godown		Totals	
	Units	Capacity	Units	Capacity	Units	Capacity	Units	Capacity
Northeastern								
Kunduz			3	4,500	2	6,400	5	10,900
Baghlan	1	20,000	1	1,000	4	5,900	6	26,900
Takhar			5	8,000	7	3,424	12	11,424
Badakashan	—	—	2	2,500	3	1,100	5	3,600
Subtotal	1	20,000	11	16,000	16	16,824	28	52,824
Northern								
Samangan			2	3,000	3	2,520	5	5,520
Balkh			2	4,000	6	7,870	8	11,870
Jawzjon			2	2,500	5	6,850	7	9,350
Faryab	—	—	1	1,000	6	4,760	7	5,760
Subtotal			7	10,500	20	22,000	27	32,500
Western								
Herat	1	20,000	3	3,500	1	6,000	5	29,500
Badghis			2	3,500			2	3,500
Farah			1	2,000	2	1,800	3	3,800
Ghor	—	—	2	3,000	—	—	2	3,000
Subtotal	1	20,000	8	12,000	3	7,800	12	39,800
Southwestern								
Kandahar	1	20,000	3	4,000	1	1,500	5	25,500
Helmand			2	3,000	1	1,500	3	4,500
Nimroz	—	—	3	4,500	—	—	3	4,500
Subtotal	1	20,000	8	11,500	2	3,000	11	34,500
Southern								
Zabul			2	4,000			2	4,000
Urozgan			2	2,500			2	2,500
Chazni			1	2,000	5	4,800	6	6,800
Paktia	—	—	3	5,000	—	—	3	5,000
Subtotal			8	13,500	5	4,800	13	18,300

Table continued-

Region & Province	Silo Units	Silo Capacity	Hangar Units	Hangar Capacity	Godown Units	Godown Capacity	Totals Units	Totals Capacity
Central								
Kabul	2	50,000	7	13,000	23	10,000	32	73,000
Logar					2	2,400	2	2,400
Bamyan			2	2,000	2	1,105	4	3,105
Parwan					1	1,200	1	1,200
Kapesa			1	1,000			1	1,000
Maydan					3	3,600	3	3,600
Subtotal	2	50,000	10	16,000	31	18,305	43	84,305
Eastern								
Laghman			1	1,500	2	2,000	3	3,500
Nangarhar			2	3,000	8	6,600	10	9,600
Konarah			1	1,500	4	2,800	5	4,300
Subtotal			4	6,000	14	11,400	18	17,400
TOTALS	5	110,000	56	85,500	91	84,129	152	279,629

SOURCE: Food Procurement Department.

REFERENCE: Koening, N. & H.V. Hunter, (1973), "A Wheat Stabilization Program for Afghanistan" Kabul, Afghanistan, U.S.A.I.D.

ALGERIA

Algeria is provided with a network of silos and warehouses which are spread throughout the country. The silos and warehouses have been developed under two national plans for storage, one started in 1939 and another conceived in 1961. All storage facilities are Government property or controlled by the "Office Algèrien Interprofessionnel des Céréales" (OAIC). OAIC has the responsibility of maintaining a readily available supply of grain, either through local purchases or imports, for Algerian consumption.

Capacities of the Algerian grain storage network for 1968 are shown in the accompanying table. It should be pointed out that elevators can be used to 80-85 percent of stated capacity and capacities of "specially fitted warehouses" should be considered 60-65 percent of that stated. The "not specially fitted" and rented warehouses are, on the whole, small and not suitable for prolonged storage.

Indications are that a storage deficit exists in the Constantine Region and that additional capacity is needed at the Port of Algiers.[1)]

No data on farm storage are included.

[1)] SOURCE: FAO, Commodities and Trade Division.

ALGERIAN GRAIN STORAGE CAPACITY

Region	Grain silos (elevators) and specially fitted warehouses		Warehouses not specially fitted	Rented Warehouses	Total
	Bins	Warehouses			
	thousand tons				
Algiers	45	32	13	48	138
Oran	332	211	104	75	722
Constantine	153	148	44	40	385
TOTALS	530	391	161	163	1,245

SOURCE: FAO, Commodities and Trade Division, 1968.

BANGLADESH

On the average, less than one sixth of the total grain in storage in Bangladesh is held on Government account. Approximately 50 percent of all grain moving through market channels is imported and handled by the Food Department.

In the aggregate, farm and dealer stocks account for about 84 percent of the total grain stored. Rice is stored in the rough (or paddy) rice form until hulled for consumption.[1)]

Private storage capacity for the most part is leased by the Food Department.[1)]

Fairly extensive data was published by Weitz-Hettelsater on location and types of storage controlled by the Government in 1964. Local Supply Depot (LSD) godowns with capacity of 408,365 tons were controlled by the Directorate of Procurement, Distribution and Rationing, Food Department. Central Supply Depot (CSD) godowns with capacity of 254,169 tons were controlled by the Directorate of Movement and Storage, Food Department. (See Tables 1 and 2.)

More recent information[2)] indicates that total storage capacity existing November 1973 was as follows:

TYPE OF STORAGE		CAPACITY
Silos		225,000 M.T.
Chittagong	100,000 M.T.	
Narayangari	75,000 M.T.	
Ashuganj	50,000 M.T.	
Central Supply Depot (CSD)		360,000 M.T.
Local Supply Depot (LSD)		473,000 M.T.
TOTAL		1,058,000 M.T.

1) Weitz-Hettelsater Engineers, Inc. (1964) Food Grain Storage and Handling Facilities - East Pakistan. 234 p.

2) Republic of Bangladesh, The First Five Year Plan 1973-1978, Planning Commission, Government of Bangladesh.

BANGLADESH

STORAGE SPACE IN LSD's OWNED OR CONTROLLED BY DIRECTORATE OF PROCUREMENT, DISTRIBUTION AND RATIONING FOOD DEPARTMENT, GOVERNMENT OF EAST PAKISTAN, BY DISTRICTS, MARCH 1964

District	Locations	Old Godowns	New Godowns		Total Government Godowns	Hired Godowns	Total
			First Five Year Plan	Second Five Year Plan [a]			
	(Number)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)	(Tons)
Dinajpur	23	8,078	5,500	11,000	24,578	8,258	32,836
Rangpur	23	1,983	9,000	4,000	14,983	17,238	32,221
Bogra	10	12,800	1,500	2,500	16,800	10,425	27,225
Rajshahi	19	10,151	6,000	1,500	17,651	6,621	24,272
Pabna	6	1,500	6,000	5,500	13,000	4,866	17,866
Kushtia	8	800	4,000	4,500	9,300	2,585	11,885
Jessore	14	1,200	8,000	3,500	12,700	9,179	21,879
Khulna	16	10,663	4,000	7,000	21,663	1,042	22,705
Barisal	27	4,230	13,500	6,500	24,230	3,763	27,993
Mymensingh	35	6,245	15,500	11,500	33,245	23,411	56,656
Dacca	16	--	9,000	9,500	18,500	4,921	23,421
Faridpur	16	--	14,000	2,000	16,000	8,932	24,932
Sylhet	22	4,224	6,000	4,500	14,724	4,677	19,401
Comilla	16	1,800	15,000	10,500	27,300	312	27,612
Noakhali	14	500	12,000	5,500	18,000	1,486	19,486
Chittagong	12	800	5,000	7,000	12,800	367	13,167
Chittagong Hill Tracts	10	--	1,500	2,500	4,000	808	4,808
Total	287	64,974	135,500	99,000	299,474	108,891	408,365
Other Storing Agencies	90	--	--	--	--	--	105,694
TOTAL ALL SPACE	377	--	--	--	--	--	514,059

[a] Approximately 50,000 tons of this capacity is not yet available for use; completion expected by June 1, 1965.

SOURCE: Directorate of Procurement, Distribution and Rationing, Food Department, Government of East Pakistan.

REFERENCE: "Food Grain Storage and Handling Facilities -- East Pakistan" Weitz-Hettelsater Engineers, Inc. 1964, 334 p.

BANGLADESH

STORAGE SPACE IN VARIOUS TYPES OF CSD's OWNED OR CONTROLLED BY DIRECTORATE OF MOVEMENT AND STORAGE, FOOD DEPARTMENT, GOVERNMENT OF BANGLADESH

Location	1964[1] Total Govt. Owned Godowns No.	1964[1] Total Govt. Owned Godowns Capacity (Tons)	1964[1] Hired Godowns No.	1964[1] Hired Godowns Capacity (Tons)	1964[1] Total Godowns No.	1964[1] Total Godowns Capacity (Tons)	1971-72[2] Total Godowns No.	1971-72[2] Total Godowns Capacity (Tons)
Khulna Area								
Khulna	85	65,600	-	-	85	65,600	85	65,600
Maheswarpasha	-	-	6[a]	7,200[a]	6	7,200	38	40,000
Khulna Area Total	85	65,600	6	7,200	91	72,800	123	105,600
Dacca Area								
Narayanganj	32	19,650	1	350	33	20,000	33	20,000
Dacca	23	13,200	-	-	23	13,200	19	11,100
Tejgaon	59	34,900	-	-	59	34,900	43	34,000
Dacca Area Total	114	67,750	1	350	115	68,100	95	66,000
Chandpur Area	24	12,500	2	2,077	26	14,577	11	12,200
Chittagong Area	64	32,500	1	14,592	65[b]	47,092	91	92,000
Santahar Area	41	20,600	-	-	41	20,600	32	20,000
Mymensingh Area	32	16,000	-	-	32	16,000	32	16,000
Barisal Area	30	15,000	-	-	30	15,000	15	15,000
Multuli Area	-	-	-	-	-	-	26	26,000
TOTAL	390	229,950	10	24,219	400	254,169	207	181,200

1) REFERENCE: "Food Grain Storage and Handling Facilities--East Pakistan" Weitz-Hettelsater Engineers, Inc. 1964, 334 p.

a] Only 6 of the 33 godowns under construction by the Central Government have been turned over to the Food Department, Government of East Pakistan; complete control expected in 1964/65.

b] Eleven godowns (capacity 9,600 tons) totally damaged by cyclone, two godowns used for salt storage, and one godown for relief agency use not included.

SOURCE: Directorate of Movement and Storage, Food Department, Government of East Pakistan.

2) Personal Communication, Agricultural Attaché, February 26, 1975.

SOURCE: Directorate of Movement and Storage, Food Department, Government of Bangladesh.

EGYPT

A report prepared by Weitz-Hettelsater Engineers in 1961[1] recommended a total of 743,000 M.T. silo storage and 210,000 M.T. of flour storage for Egypt. Silo storage recommended at Alexandria and Cairo was 80,000 M.T. and 120,000 M.T., respectively.

A recent study indicated that the only major permanent storage facilities now existing consist of a 48,000 M.T. complex in Alexandria at the port unloading site and a 58,000 M.T. complex in Cairo located on the Nile River's west bank. Both facilities consist of permanent concrete bins and were constructed in 1962.[2]

Sacked grain is stored in open areas known as "shounas." Shouna's are the primary means of storing bagged grains in Egypt. Sacks of grain are stacked 9 to 10 sacks high on 4-inch square timbers spaced 18 inches apart on bare earth.

Enclosed warehouses available for storage are few and appear to be primarily used for sacked flour and a minor amount of sacked brown beans.[2]

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1) Grain Storage and Distribution System for Agricultural Credit and Cooperative Bank -- Southern Region, United Arab Republic" Weitz-Hettelsater Engineers, Inc. August 1961.

2) Jack, D. S. (1975) Evaluation and Cost Estimates for Grain Unloading, Storage and Distribution Facilities in Egypt. Grain Storage, Processing and Marketing Report No. 50. Food and Feed Grain Institute, Kansas State University, Manhattan, Kansas May 1975.

INDIA

No data is presented here on capacities or quantities of grain on farms.

Farm storage methods vary by region and type of grain. Storage of paddy rice by farmers, for food or seed, is very often in bulk, in locally constructed containers which may be made from a range of materials. Wheat stored on farms may be stored in bags or in bulk. Bulk quantities may be retained in a corner of a room by woven wall or it may be stored in mud or wooden bins within dwellings. Oil drums have been used for this purpose also. In dry regions wheat is stored in underground pits.

After being sold in the market place nearly all grain is handled in bags in storage until processed for consumption.

Traders and millers in primary and terminal markets store grain stocks in private warehouses known as "godowns." Godowns are usually constructed of brick and mud or brick and mortar. No information exists on the extent of such warehouse space in markets. Public or government operated warehouses storage capacity is said to account for only about 5 percent of the total food grain production. In addition to the warehouse storage space in the accompanying table at least two 10,000 M.T. capacity metal silos have been constructed with U.S. assistance.

Reference: "India," Bulletin of Grain Technology, Food Grain Technologists' Research Association of India, Hapur, Vol. 7, No. 2, June 1969.

INDIA

STATE AND AGENCIES WISE DISTRIBUTION OF OWNED STORAGE CAPACITY IN THE COUNTRY AS ON April 1, 1968

(1000 tons)

State	Food Dept. and F.C.I.	State Government	C.W.C.	SWCs	Coopera-tives	Total
Andhra Pradesh	109.7	88.1	317.9*	18.5	152.0	706.2
Assam	36.2	16.0	18.0	13.0	64.0	147.2
Bihar	160.0	26.3	--	--	221.0	407.3
Gujarat	48.6	143.9	13.0	7.2	177.0	389.7
Haryana	15.3	31.4	--	7.0	4.0	57.7
Kerala	134.3	39.3	8.2	17.8	71.0	270.6
Madhya Pradesh	45.9	81.8	10.9**	19.5	186.0	344.1
Tamil Nadu	191.7	4.5	213.1**	28.8	208.0	646.1
Maharashtra	503.8	376.0	24.2	39.4	389.0	1332.4
Mysore	59.9	49.3	14.9	33.2	391.0	548.3
Orissa	15.3	41.1	5.0	6.1	55.0	122.5
Punjab	33.1	31.7	1.0	8.5	183.0	257.3
Rajasthan	65.0	48.7	15.4	19.8	92.0	240.9
Uttar Pradesh	306.3	48.3	10.0	--	196.0	560.6
West Bengal	223.2	273.0	--	--	105.0	609.8
Jammu and Kashmir	--	63.0	--	--	--	63.0
Union Territories	135.8	33.8	--	--	23.0	192.6
Total:	2104.1	1396.2	651.6	227.4	2517.0	6826.3
Anticipated	2624.00	--	654.00	228.00	2600.00	--

* Includes 2.87 lakh tonnes constructed under crash programme.
** Includes 2 lakh tonnes constructed under crash programme.

REFERENCE: "India," Bulletin of Grain Technology, Food Grain Technologists' Research Association of India, Hapur, Vol. 7, No. 2, June, 1969.

FCI = Food Corporation of India.
CWC = Central Warehousing Corporation.
SWC = State Warehouseing Corporation.

INDIA

FOOD CORPORATION OF INDIA AND CENTRAL AND STATE WAREHOUSING CORPORATION STORAGE ACCOMODATIONS AS OF DEC. 31, 1972[1)]
STORAGE CAPACITY (1000 METRIC TONS)

Location	FOOD CORP. INDIA Owned	Hired	Total	CENTRAL WAREHOUSING No. Whses	Capacity	STATE WAREHOUSING No. Whses	Capacity
Andhra Pradesh	175.3	301.9	477.2	29	3,759.5	36	76.5
Assam	59.9	126.0	185.9	3	229.0	27	35.5
Bihar	197.6	31.6	229.2	2	66.8	44	58.5
Gujarat	104.9	282.7	387.6	11	97.1	36	40.4
Haryana	205.6	100.7	306.3	9	668.3	39	111.4
Kerala	198.3	52.0	250.3	3	122.5	26	28.7
Madhya Pradesh	205.2	181.9	387.1	7	529.5	93	212.7
Maharashtra	740.6	129.4	870.0	14	1,354.3	67	195.9
Manipur	5.0	4.5	9.5	-	-	-	-
Mysore	71.2	39.1	110.3	7	508.3	44	69.0
Orissa	87.4	24.0	111.4	5	175.0	24	22.9
Punjab	868.5	379.7	1,248.2	7	566.6	79	132.2
Rajasthan	224.8	204.6	429.4	3	585.6	82	191.4
Tamil Nadu	239.8	50.4	290.2	11	2,375.6	25	84.0
Uttar Pradesh	687.5	582.8	1,270.3	14	292.0	50	273.5
West Bengal	324.5	1,012.0	1,336.5	8	2,507.4	25	112.9
Union Territory (Delhi)	119.0	46.1	165.1	-	388.0	-	-
Pondicherry	2.5	5.3	7.8				
TOTAL	4,517.6	3,554.7	8,072.0	133	14,225.5	697	1,645.5

[1)] Source: Food Corporation of India (1973) Bulletin on Food Statistics.

IRAN

Information available for this publication is conflicting with respect to storage capacity estimates for Iran. It should be pointed out that this is not uncommon when data is available from various sources.

The most complete and recent information on existing storage facilities is shown in Table 1.

In other undocumented information,[1] estimated storage available as of April 1974 included:

	Metric Tons
Farm	1,440,000
Milling Industry	1,500,000
Cereals Organization	
Warehouses	334,000
Silos	716,000
TOTAL	3,990,000

Other undocumented information,[1] indicated that in 1968 all permanent storage facilities were government owned and operated by the "Cereals Administration" primarily for wheat bought and sold by the Administration. An estimate of 176,000 M.T. of cement silo capacity existed in cities and that an additional 79,000 M.T. of cement silo capacity would be completed in producing areas in 1968.[1]

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[1] FAO, Commodities and Trade Division.

Table 1. Existing Conventional Storage Capacity for Agricultural Products

(Tons)

Province	Cereal Org.	Sugar Org.	Coopera-tives	On farm*	Private* Trade	Total
Central/Zanjan	242,450	47,500	16,750	354,674	265,626	927,000
Gilan	23,000	8,000	28,000	107,015	370,985	537,000
Mazandaran/Gorgan	43,200	800	19,900	276,621	424,479	765,000
East Azarbaijan	117,500	7,000	6,250	297,247	227,003	655,000
West Azarbaijan	85,500	14,050	4,750	147,602	125,098	377,000
Kermanshahan	76,000	3,000	11,850	97,023	14,127	202,000
Khuzestan	84,400	28,670	7,550	155,232	311,148	587,000
Fars/Kohkeluyeh	39,200	4,000	16,050	157,386	194,364	411,000
Kerman	15,000	4,100	12,250	26,650	30,000	88,000
Khorassan	50,000	12,000	14,250	249,380	413,370	739,000
Esfahan/Yazd	124,000	11,500	27,500	116,000	118,000	297,000
Sistan/Baluchistan	13,200	670	9,600	11,000	44,530	79,000
Kordestan	43,000	3,000	2,500	86,354	24,146	159,000
Lorestan	60,000	5,200	8,250	77,538	30,012	181,000
Hamadan	49,300	5,000	4,800	103,159	156,741	319,000
Semnan	750	450	6,250	22,842	25,708	56,000
Ilam	--	--	500	39,149	52,351	92,000
Saheli	40,000	--	5,750	4,250	25,000	75,000
Bakhtiari	--	3,200	1,500	44,480	141,820	191,000
TOTALS	1,006,500	158,140	204,250	2,373,602	2,994,508	6,737,000

*Estimated in the case of farm storage and private commercial storage.

SOURCE: Conventional Storage Capacity Requirements for Agricultural Products in Iran, Up to 1361. Centre for Agricultural Marketing Development, Serial No. 137, Tehran, July 1974.

NESA Appendix 10

JORDAN

Data reported as open storage at mills would normally not be considered suitable for safe storage of grain. It consists of asphalt or concrete paved surfaces adjacent to flour mills.[1)]

1) Personal Communication, U. S. Agricultural Attache, Beirut, February 5, 1975.

GRAIN STORAGE FACILITIES
EAST BANK OF JORDAN

District	Ministry of Supply			Mills			Private (Estimate)			All Storage
	Covered	Open	Total	Covered	Open	Total	Commercial	Farm	Total	
				-- METRIC TONS --						
Amman	10,000	--	10,000	40,000	5,000	45,000	40,000	4,000	44,000	99,000
Irbid	1,000	--	1,000	5,000	2,500	7,500	10,000	3,000	13,000	21,500
Balqa	--	--	--	--	--	--	4,000	1,000	5,000	5,000
Karak	1,000	--	1,000	--	--	--	4,000	2,000	6,000	7,000
Ma'an	--	--	--	--	--	--	--	--	--	--
Rented in Districts	20,000	--	20,000	--	--	--	--	--	--	20,000
TOTAL	32,000		32,000	45,000	7,500	52,000	58,000	10,000	68,000	152,500

Source: Above data on grain storage facilities has been obtained from the Ministry of Supply, except for data under the heading "Private" which represents USAID/Amman's best estimate. No reliable statistics on private grain storage facilities are available.

NOTE: The Government of Jordan is constructing additional storage facilities for 20,000 tons of bagged grain at Ruseifeh and Amman. Land was bought at Ma'an and Irbid to build government grain storage facilities for 5,000 M.T. and 20,000 M.T. respectively. Plans have also been made to construct small grain storage units in various districts with an average capacity of 40,000 - 50,000 tons. The Jordanian Government is contemplating the construction of a bulk grain handling and storing facility at Aqaba Port for approximately 30,000 tons. The Jordanian Government has requested USAID to finance the services of an engineering firm to: (1) review available studies, reports and other materials on grain storage in Jordan, (2) recommend the size and type of grain storage facility needed at Aqaba, and (3) design the facility together with the associated grain handling equipment and prepare specifications and tender documents needed to invite bids for construction.

LEBANON

No data are included here for farm or private (flour mills, feed mills, etc.) grain storage facilities.

The Lebanese Cereals and Sugarbeet Office operates the following grain storage facilities:

Location	Storage Capacity (M.T.) Flat Storage	Bulk Storage	Remarks
Beirut	--	105,000	Port Silo
Sidon	1,000	--	Rented
Tel Amara	15,000	--	Additional 6,000 M.T. under const.
Tripoli	--	5,000	
TOTAL	16,000	110,000	

SOURCE: Personal Communication, U. S. Agricultural Attaché, Beirut. February 5, 1975.

MOROCCO

Data included here appear to be the most reliable figures available although there were discrepancies between data from various sources.

Storage of grain on farms is for the most part accomplished in underground earthen pits. The pits hold as much as 110 quintals and approach hermetic or "airtight" storage. Deterioration apparently is not severe in this type of storage. No estimate of farm storage capacity is available.[1)]

In addition to data presented in the accompanying tables, more recent information indicates that silo storage capacity at Casablanca has been increased to 70,000 M.T. and at Safi to 24,000 M.T. The Moroccan Cereals Office has also indicated plans to build a 40,000 M.T. storage facility at Tangier in the "free port" area to serve international grain traders and smaller ports along the North and West African coasts.[2)]

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1) Ackels, A.A. and J.R. Pedersen, (1969), "Review of Grain Storage Handling and Distribution--Morocco 1969." Food Grain Drying, Storage, Handling and Transportation Report No. 10, Food and Feed Grain Institute, Kansas State University.

2) Personal communication, U.S. Agricultural Attaché, March 14, 1975.

MOROCCO: SUMMARY OF CEREAL GRAIN STORAGE CAPACITIES BY TYPE AND ORGANIZATION

Organization	Bulk Storage Silo	Bulk Storage Flat	Warehouse (x1000 Q)	Total	Storage Under Tarpaulin	Fumigation Chambers Capacity	Fumigation Chambers Number
Cooperatives'	1,402.0	132.0	2,813.0	4,347.0	1,320.9	57.2	75
Commercial	80.0	5.0	5,682.4	5,767.4	2,268.2	90.1	131
General Warehouses	0.0	0.0	280.0	280.0	0.0	5.0	5
Flour Mill	397.6	4.2	1,055.7	1,457.5	240.3	4.2	6
Port Silos	600.0	100.0	0.0	700.0	0.0	2.0	2
TOTAL	2,479.6	241.2	9,831.1	12,551.9	3,829.4	158.5	219

Source: OCIC (1968) Entreposage des Cereales des Maroc, 12 Jan 1968.

Reference: Ackels, A.A. and J.R. Pedersen, (1969), "Review of Grain Storage Handling and Distribution--Morocco 1969." Food Grain Drying, Storage, Handling and Transportation Report No. 10, Food and Feed Grain Institute, Kansas State University.

Mensuration Equivalents

1 Quintal = 0.1 Metric Ton = 220.462 Pounds

CEREAL GRAIN STORAGE CAPACITIES BY TYPE AND LOCATION IN MOROCCO

LOCATION	Organization	Bulk Storage Silo	Bulk Storage Flat	Warehouse (X1000 Q.)	Total	Storage Under Tarpaulin	Fumigation Capacity	Chambers Number
Oujda	Cooperatives[1]	108.0	-	95.0	203.0	97.6	-	-
	Commercial	-	-	213.7	213.7	22.5	0.8	2
	Flour Mill	1.0	-	132.1	133.1	17.0	-	-
	TOTAL	109.0	-	440.8	549.8	137.1	0.8	2
Taza	Cooperatives[1,2]	-	30.0	83.0	113.0	23.5	2.1	4
	Commercial	-	-	29.7	29.7	-	-	-
	Flour Mill	-	-	23.4	23.4	-	-	-
	TOTAL		30.0	136.1	166.1	23.5	2.1	4
Fez	Cooperatives[1,2]	172.0	-	483.0	655.0	180.0	5.2	7
	Commercial	-	-	447.0	447.0	152.5	6.2	11
	Flour Mill	24.8	1.0	139.7	165.5	21.0	-	-
	TOTAL	196.8	1.0	1,069.7	1,267.5	353.5	11.4	18
Meknes	Cooperatives[1]	357.0	-	340.0	697.0	60.0	4.0	4
	Commercial	5.0	5.0	567.5	577.5	156.0	12.2	14
	Flour Mill	10.6	-	84.0	94.6	1.1	-	-
	TOTAL	372.6	5.0	991.5	1,369.1	217.1	16.2	18

CEREAL GRAIN STORAGE CAPACITIES BY TYPE AND LOCATION IN MOROCCO (Con't)

LOCATION	Organization	Bulk Storage Silo	Bulk Storage Flat	Warehouse (X1000 Q.)	Total	Storage Under Tarpaulin	Fumigation Chambers Capacity	Fumigation Chambers Number
Settat	Cooperatives	(See Casablanca)						
Benahmed	Cooperatives	(See Casablanca)						
	Commercial	-	-	20.0	20.0	25.0	-	-
	TOTAL	-	-	20.0	20.0	25.0	-	-
Berrechid	Cooperatives	(See Casablanca)						
	Commercial	-	-	68.2	68.2	9.0	2.3	2
	Flour Mill	54.8	-	40.0	94.8	40.0	-	-
	TOTAL	54.8	-	108.2	163.0	49.0	2.3	2
El Jadida	Cooperatives[1]	-	-	206.0	206.0	46.3	5.6	4
	Commercial	-	-	188.9	188.9	74.0	4.2	8
	Flour Mill	-	1.7	42.3	44.0	-	-	-
	TOTAL	-	1.7	437.2	438.9	120.3	9.8	12
Oued Zem	Cooperatives[1]	-	72.0	266.0	338.0	197.5	4.2	6
	Commercial	-	-	359.0	359.0	236.5	2.8	7
	Flour Mill	1.1	-	27.9	29.0	3.0	-	-
	TOTAL	1.1	72.0	652.9	726.0	437.0	7.0	13

CEREAL GRAIN STORAGE CAPACITIES BY TYPE AND LOCATION IN MOROCCO (Con't)

LOCATION	Organization	Bulk Storage Silo	Bulk Storage Flat	Warehouse (X1000 Q.)	Total	Storage Under Tarpaulin	Fumigation Chambers Capacity	Fumigation Chambers Number
Safi	Cooperatives[1]	-	-	221.0	221.0	222.0	4.2	8
	Commercial	-	-	150.8	150.8	66.0	2.4	3
	Flour Mill	4.6	-	18.8	23.4	10.2	1.2	2
	Port Silo	240.0	-	-	240.0	-	-	-
	TOTAL	244.6	-	390.6	635.2	298.2	7.8	13
Essouira	Cooperatives[1]	-	-	81.0	81.0	25.0	1.5	3
	Commercial	-	-	109.4	109.4	49.0	3.6	6
	Flour Mill	-	-	2.5	2.5	-	-	-
	TOTAL	-	-	192.9	192.9	74.0	5.1	9
Marrakech	Cooperatives[1]	170.0	-	170.0	340.0	-	2.4	3
	Commercial	-	-	61.0	61.0	38.2	1.6	2
	Flour Mill	-	-	16.0	16.0	22.0	-	-
	TOTAL	170.0	-	247.0	417.0	60.2	4.0	5
Agadir	Cooperatives[1]	-	30.0	5.0	35.0	-	1.6	2
	Flour Mill	60.0	-	36.0	96.0	8.0	-	-
	TOTAL	60.0	30.0	41.0	131.0	8.0	1.6	2

Source: OCIC (1968) Entreposage des Cereales des Maroc 12 Jan 1968.

[1]Cooperatives include SCAM, CMA and UDS Storage Facilities. Data has been updated to include theoretical storage capacities of warehouse and bulk storage facilities as of 31 Mar. 1969 by SCAM.

CEREAL GRAIN STORAGE CAPACITIES BY TYPE AND LOCATION IN MOROCCO (Con't)

LOCATION	Organization	Bulk Storage Silo	Bulk Storage Flat	Warehouse (X1000 Q.)	Total	Storage Under Tarpaulin	Fumigation Chambers Capacity	Fumigation Chambers Number
Tanger	Commercial[1]	-	-	1.7	1.7	-	-	-
	Flour Mill	10.2	-	34.8	45.0	35.0	-	-
	TOTAL	10.2	-	36.5	46.7	35.0	-	-
Tetouan	Cooperatives[1]	-	-	42.0	42.0	7.0	-	-
	TOTAL	-	-	42.0	42.0	7.0	-	-
Larache	Flour Mill	28.25	-	8.0	36.25	8.0	-	-
	TOTAL	28.25	-	8.0	36.25	8.0	-	-
Kenitra	Cooperatives[1,3]	230.0	-	363.0	593.0	146.0	9.4	14
	Commercial	-	-	1,257.0	1,257.0	580.5	28.2	32
	Flour Mill	2.25	-	11.0	13.25	-	-	-
	Port Silo[4]	60.0	-	-	60.0	-	-	-
	TOTAL	292.25	-	1,631.0	1,923.25	726.5	37.6	46
Souk-El-Arba	Cooperatives	(See Kenitra)						
	Commercial	-	-	22.0	22.0	32.0	0.7	1
	Flour Mill	4.0	-	22.0	26.0	3.0	-	-
	TOTAL	4.0	-	44.0	48.0	35.0	0.7	1

CEREAL GRAIN STORAGE CAPACITIES BY TYPE AND LOCATION IN MOROCCO (Con't)

LOCATION	Organization	Bulk Storage Silo	Bulk Storage Flat	Warehouse (X1000 Q.)	Total	Storage Under Tarpaulin	Fumigation Capacity	Chambers Number
Sidi Kacem	Cooperatives	(See Kenitra)						
	Commercial	-	-	35.0	35.0	5.0	0.7	1
	TOTAL	-	-	35.0	35.0	5.0	0.7	1
Ksiri	Cooperatives	(See Kenitra)						
Sidi Slimane	Cooperatives	(See Kenitra)						
Rabat	Cooperatives[1]	100.0	-	290.0	390.0	60.0	7.2	8
	Commercial	-	-	151.0	151.0	61.0	2.4	4
	Flour Mill	44.0	-	46.0	90.0	-	-	-
	TOTAL	144.0	-	487.0	631.0	121.0	9.6	12
Casablanca	Cooperatives[1,5]	265.0	-	168.0	433.0	256.0	9.8	12
	Commercial	75.0	-	2,000.5	2,075.5	761.0	22.0	38
	Gen. Whses.	-	-	280.0	280.0	-	5.0	5
	Flour Mill	152.0	1.5	371.2	524.7	72.0	3.0	4
	Port Silo[4]	300.0	100.0	-	400.0	-	2.0	2
	TOTAL	792.0	101.5	2,819.7	3,713.2	1,089.0	41.8	61

Footnotes continued

[2]SCAM data (31 Mar. 1969) Combine Taza and Fes capacities and show 5,000 qx. more bulk and 5,000 qx. less warehouse capacity than shown above.

[3]Figures presumably include storage in cities of Souk El Arba, Sidi Kacem, Ksiri, Sidi Slimane and Kenitra in Kenitra Province.

[4]Elevators used primarily for import-export of grain. Elevators at Kenitra and Casablanca operated by Ministry of Commerce; Elevator at Safi operated by OCIC.

[5]Figures presumably include storage in cities of Settat, Benahmed, Berrechid and Casablanca. However, SCAM data of 31 Mar. 1969 indicates 221,000 M.T. less silo storage and 125,000 M.T. less warehouse capacity than OCIC data of 1967.

REFERENCE: Ackels, A.A. and J.R. Pedersen, (1969), "Review of Grain Storage Handling and Distribution--Morocco 1969." Food Grain Drying, Storage, Handling and Transportation Report No. 10, Food and Feed Grain Institute, Kansas State University.

Mensuration Equivalents:

1 Quintal = 0.1 Metric Ton = 220.462 Pounds

NEPAL

Storage practices at the farm and village level are traditionally the same throughout the country and have been used for many years without modification. The specific type of storage depends on the availability of local building materials. Storage at this level ranges from piling grain on the ground uncovered, hanging from rafters inside dwellings; storage in a variety of small containers to bins made of bamboo, mud and/or straw to wood. Recently a reinforced concrete farm bin of 4-5 ton capacity has been developed and is being used in some areas.

At the processor, cooperative or trader level, grain is stored in bags in buildings constructed of a variety of materials. Cooperative warehouses range in capacity from 50 to 500 metric tons capacity. Rice mill storage in some cases is 750 to 1,500 metric tons.

Government Food Corporation warehouses range in size from 500 to 4,000 metric tons in capacity and is used principally for milled rice.

FOOD CORPORATION OF NEPAL
WAREHOUSE LOCATION AND CAPACITY

		Location	Capacity/M.T.
1.	Nepalgunj	Tarai	500
2.	Bardia	Tarai	500
3.	Dhangarhi	Tarai	500
4.	Amlokhgani*	Inner-Tarai	500
5.	Hetura*	Inner-Tarai	1,000
6.	Bharatpur	Inner-Tarai	100
7.	Biratnagar	Tarai	500
8.	Kathmandu*	Valley	4,000

* Warehouse being utilized at present.

Reference: Pfalser, D.R., (1972), "Storage Drying and Transportation of Agricultural Commodities." Ministry of Food and Agriculture Marketing Conference Proceedings. Document No. 16, Kathmandu, February 21-24, 209-232 p.

PAKISTAN

No data is given or appears to be available for farm storage capacities.

Total government storage capacity has increased significantly over the past several years as indicated in the following summary:

STORING AGENT	LONG TONS OF STORAGE CAPACITY			
	1968[1)]	1972-73[2)]	June 1974[3)]	June 1975*[3)]
Central Government	377,000	705,000	715,000	939,000
Provincial Government	589,890	894,005	926,005	956,005
TOTAL	966,890	1,599,005	1,641,005	1,890,000

*Estimated Storage Capacity

References: [1]Wendling, T. (1968) "Assessment of Food Grain Storage Facilities, West Pakistan. Food Grain Drying, Storage, Handling and Transportation Report No. 7, Food and Feed Grain Institute, Kansas State University.

[2]Government of Pakistan (1974) Pakistan Economic Survey, 1972-73.

[3]Personal Communication, U.S. Agricultural Attaché, Feb. 29, 1975.

PAKISTAN

Government Storage Capacity of Foodgrains - 1973-74

Location	Storage capacity - June 30, 1974
1. Central Government (Karachi)	
Kemari	25,000 long tons[1]
T. P. X.	70,000 " "
Landhi	210,000 " "
Pipri	400,000 " "
Sub total	715,000[2]
2. Provinces	
Punjab	546,785 long tons[3]
Sind	235,620 " "
NWFP	86,000 " "
Baluchistan	57,600 " "
Sub total	926,005
Grand total	1,641,005

1) One long ton = 1.016 Metric Tons.

2) Total includes about 10,000 tons storage whose location is unknown.

3) Includes 18,785 tons capacity owned by the cooperative banks and market committees but leased by the government.

Source: Personal Communication, U.S. Agricultural Attaché, Feb. 21, 1975.

PAKISTAN

Private Storage Facilities

1.	Commercial Godown Capacity	Metric Tons
	Karachi	--- 500,000
	Lahore	--- 500,000
	Peshawar	--- 100,000
	Rawalpindi	--- 100,000
	Hyderabad	--- 100,000
	Multan	--- 100,000
	Quetta	--- 50,000
	Sukkur	--- 100,000
	Jacobabad	--- 50,000
	Lyallpur	--- 150,000
	Sahiwal	--- 50,000
	Sialkot	--- 50,000
	Bahawalpur	--- 50,000
	Gujranwala	--- 50,000
	Jhelum	--- 50,000
	Total Commercial	2,000,000
2.	Zamindar-Cultivator Storage	- 2,000,000
3.	Commission Agents' Storage	--- 400,000
4.	Roller Flour Mill Storage	--- 100,000
	Total Storage	- 5,466,890 Tons

Reference: Wendling, T., (1968), "Assessment of Food Grain Storage Facilities, West Pakistan" Food Grain Drying, Storage, Handling and Transportation Report No. 7, Food and Feed Grain Institute, Kansas State University, Manhattan, Kansas

SYRIA

In late 1971, the Syrian Arab Republic started implementation of a Grain Silos Project which consists of silos for grain storage, certified seed plants, farmers' seed plants and feed mills.[1)]

The project consists of:

(1) 15 grain silos located in the different Mohafazats (Provinces) with a total storage capacity of 350,000 tons. After modification and expansion, the storage capacity is predicted to be 810,000 tons. (See the accompanying table 1.)
An export silo currently exists at Latakia with a capacity of 40,000 tons.

(2) Erection of 11 seed plants for cleaning and treating seeds for farmers. Three plants are planned, each with a capacity of 10,000 tons per year. Three fully automatic plants are to be located at Kamishly, Raqqa and Qalaat Al Madiq. Eight others will be located with grain silos.

(3) Erection of two (2) feed production mills; one in Aleppo and the other in Hama. Annual production is to range between 40,000 and 70,000 tons per year for each mill.

As of early 1975, only the Aleppo silo has been completed under the new project and it should be in operation for the next crop.[2] In addition to the new silo and the silo at Latakia, Syria has storage facilities for large quantities of grain of the flat warehouse type for bagged grains. The Syrian General Organization for Cereals and Mills (GOCM) indicates a total of 450,000 M.T. storage capacity for bagged grains built by GOCM.[3]

The Syrian Ministry of Agriculture and Agrarian Reform is also involved in building grain storage facilities with the assistance of FAO/WFP aid and government financing. See Table 2.[4]

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1) Grain Silos in the Syrian Arab Republic. Major Projects Administration, Ministry of Public Works and Water Resources.

2) Personal communication, U. S. Agricultural Attaché, Beirut, Lebanon, February 5, 1975.

3) Personal communication, U. S. Agricultural Attaché, Beirut, Lebanon, March 24, 1975.

4) Data from World Food Program Office in Damascus in personal communication, U. S. Agricultural Attaché, Beirut, Lebanon, March 10, 1975.

Table 1. SYRIAN ARAB REPUBLIC
GRAIN SILOS PROJECT

Province	Location	Bulk Storage Capacity	Capacity After Projected Expansion	Remarks
Jezireh	Hasakeh	20,000	70,000	
	Kamishly	50,000	100,000	
	Tell Alo	50,000	50,000	
	Derbassiyeh	20,000	20,000	
Deir-ez-Zor	Deir-ez-Zor	--	20,000	
Al-Rashid	Raqqa	20,000	50,000	
Aleppo	Aleppo (Blat village)	20,000	100,000	40,000 completed 1975
Idleb	Idleb	--	20,000	
Hama	Hama (Kafar Baham village)	20,000	50,000	
	Qalaat Al-Madiq	--	20,000	
Homs	Homs	20,000	50,000	
Damascus	Damascus	40,000	100,000	
Deraa	Izraa	20,000	20,000	
Tartous	Tartous port	50,000	100,000	Equipped for import & export operations
Project Total----------		350,000	770,000	
Latakia	Latakia Harbour	40,000	40,000	Existing import & export operations
Total Projected Silo Storage---------		390,000	810,000	

Table 2.

SYRIAN ARAB REPUBLIC
MINISTRY OF AGRICULTURE AND AGRARIAN REFORM

Grain and Feed Stores[1]

	Built through WFP Aid					
	Pr. 002 & Exp. Stabilization and Development of Nomadic Sheep Husbandry			Pr. 2018 Development of Livestock and Fodder Production		
PROVINCE	No. Units	Size (M^3)	Capacity (M.T.)	No. Units	Size	Capacity
Aleppo	---	---	---	7	36,426	21,854
Al-Suweida	---	---	---	---	---	---
Damascus	---	2,750	1,650	3	10,566	6,339
Deir-ez-Zor	---	14,088	8,452	3	21,132	12,678
Deraa	---	---	---	---	---	---
Hama	---	28,875	17,325	11	78,375	47,025
Hassakeh	---	---	---	---	---	---
Homs	---	14,088	8,452	4	17,610	10,565
Idleb	---	17,610	10,565	6	21,132	12,678
Lattakia	---	---	---	---	---	---
Raqqa	---	---	---	---	---	---
Tartous	---	---	---	---	---	---
TOTAL		77,411	46,444	34[2]	185,241	111,139

[1] Source: World Food Program Office, Damascus. February 1975.

[2] Twelve stores completed, 22 under construction. Thirteen (13) additional units are under study with estimated size of 51,769 m^3 and 31,059 M.T. capacity.

Table 2 Continued - Syrian Arab Republic

Grain and Feed Stores

	Government Financed[3]		
PROVINCE	No. Units[4]	Size (M^2)	Capacity (M.T.)
Aleppo	8	6,000	18,000
Al-Suweida	4	3,000	9,000
Damascus	8	6,000	18,000
Deir-ez-Zor	8	6,000	18,000
Deraa	4	3,000	9,000
Hama	8	6,000	18,000
Hassakeh	12	9,000	27,000
Homs	12	9,000	27,000
Idleb	8	6,000	18,000
Lattakia	4	3,000	9,000
Raqqa	8	6,000	18,000
Tartous	4	3,000	9,000
TOTAL	88	66,000	198,000

3] Construction estimated at 50 percent complete.

4] Each unit is 750 M^2 with capacity of 2,250 M.T.

TUNISIA

Grain stored on farms is mainly for seed and food purposes, however, some small farms (3-11 hectares) hold grain for sale at weekly markets. Larger farms generally sell surplus grain shortly after harvest.

In the northern area of the country, grain is generally stored in a building close to the living quarters. These buildings are usually made of the same materials as the houses - sundried brick, stone or cement black walls, usually with cement floors and roofs of straw, sheet metal, brick or tile. Grain is usually stored in bulk in a part of the storage buildings.

In the southern area underground storage pits about 3-4 meters deep and 2-2.5 meters in diameter are used.

No data is available on total storage capacity on farms.

Tables 1, 2 and 3 show the location and capacity of grain collecting centers operated by the Cooperative Centrale de Blé (COCEBLE), Cooperative Centrale des Grandes Cultures (CCGC) and the Ministry of Agriculture, Office of Cereals, respectively. Total collection center storage capacity is 1,691,800 Qx. The 140 collection centers of the Office of Cereals are widely dispersed throughout the wheat production area providing small and large farmers with conveniently located marketing points.

Most centers' facilities are constructed of concrete or stone and are used for both sack and bulk grain; some - steel framed, metal roofed structure for sack storage; and there are a few of more modern bulk design.

There are twelve large terminal elevators in Tunisia of concrete or concrete and metal silos. Capacities and location of the terminals are shown in Table 4.

Two port elevators exist in Tunisia. An export elevator owned by the CCGC is located at Bizerte but lacks bulk unloading equipment. A new import/export elevator was completed in March 1974 by the Office of Cereals at La Goulette and has a total storage capacity of 30,000 M.T.

Large flour mills have only storage for sack grain, however, capacities are unknown.

REFERENCE: Pfost, H. B. et al. (1974) "Study of the Tunisian Grain Marketing System," Food Grain Drying, Storage, Handling and Transportation Report No. 47, Food and Feed Grain Institute, Kansas State University.

TABLE 1. TUNISIA: LOCATION AND STORAGE CAPACITY OF GRAIN STORAGE FACILITIES OF "COCEBLE" [1)]

Location	Capacity Qx.
Megrine	120,000
Djebel Ouest	400,000
El Fahs	60,000
Bou Arada	40,000
El Aroussa	10,000
Le Sers	65,000
El Akhouat	40,000
Le Kef	15,000
Bou Salem	110,000
Beja	40,000
1 Silo a Mateur	60,000
1 Magasin a Tunis rue Flatters	60,000
1 Magasin a Transit a Medjez El Bab	10,000
Ousseltia	30,000
TOTAL	1,060,000

Reference: Pfost, H. B. et. al. (1974) "Study of the Tunisian Grain Marketing System," Food Grain Drying, Storage, Handling and Transportation Report #47, Food and Feed Grain Institute, Kansas State University.

1) Cooperative Centrale de Blé

TABLE 2. TUNISIA: LOCATION AND STORAGE CAPACITY OF GRAIN STORAGE FACILITIES OF "CCGC" [1]

LOCATION	Capacity Qx.
Djebel Djelloud	700,000
Manouba	600,000
Bizerte	200,000
El Fahs	40,000
Medjez El Bab	5,000
Mateur	5,000
Gafour	8,000
Magasin a Bou Salem	20,000
Magasin a Siliana	8,000
Beja	8,000
TOTAL	1,594,000

Reference: Pfost, H. B. et. al. (1974) "Study of the Tunisian Grain Marketing System," Food Grain Drying, Storage, Handling and Transportation Report #47, Food and Feed Grain Institute, Kansas State University.

[1] Cooperative Centrale des Grandes Cultures.

TUNISIA

TABLE 3.

LOCAL RECEIVING AND SALES CENTERS OF THE OFFICE OF CEREALS AND THEIR STORAGE CAPACITIES (1974)

PROVINCE OF TUNIS	Capacity
Tunis P. V C.St	140,000
Djebel Djelloud C.St	160,000
Bir Kassaa (Silos) C.St	250,000
Usine de Bir Kassaa C.St	4,000
Tebourba	10,000
El Fahs	5,000
Zaghouan	10,000
Ennadhour	1,000
Bordj El Amri	1,000
Mornaghia (Provisoire)	500
Smindja (Provisoire)	1,000
SUB-TOTAL	582,500

PROVINCE OF BIZERTE	
Bizerte	500
Mateur	40,000
Menzel Bourguiba	6,000
Ras Djebel	1,000
Sedjenane	1,000
SUB-TOTAL	48,500

PROVINCE OF NABEUL	
Nabeul	800
Korba	600
Menzel Temime	5,000
Kelibia	1,000
Houaria	2,000
Grombalia	2,500
Soliman	1,000
Bir Bou Regba	7,000
SUB-TOTAL	19,900

PROVINCE OF BEJA	
Beja	22,000
Ksar Mezouar	3,500
Sidi Smail	8,000
Teboursouk	40,000
Testour	9,000
Nefza	400
Zahret Medien	3,000
Medjez El Bab	14,000
Goubellat	16,000
SUB-TOTAL	115,900

PROVINCE OF SILIANA	
Siliana	25,000
Le Krib	19,000
Bou Arada	30,000
Gafour	20,000
El Aroussa	5,000
Makthar	25,000
Robaa	8,000
Rohia	15,000
S. Bou Rouis	10,000
SUB-TOTAL	157,000

PROVINCE OF JENDOUBA	Capacity
Jendouba	20,000
Oued Meliz	9,500
Ghardimaou	13,000
Bou Salem	15,000
Ben Bechir	4,700
Tabarka	400
Ain Draham	800
Fernana	600
SUB-TOTAL	64,000

PROVINCE OF DU KEF	
Le Kef	23,500
Sakiet Sidi Youssef	10,000
Tadjerouine	11,000
Rebiba	40,000
Kalaa Djarda	10,000
Fbba ksour (Silos) C.St	295,000
Le Ksour	18,000
Nebeur	22,000
Touireuf	12,000
Sers	40,000
El Akhouat (Provisoire)	1,000
Ain Kerma (")	1,000
Oued Sarrat (")	1,000
Sers Marja (")	1,000
Dahmani Achats	5,000
SUB-TOTAL	490,500

PROVINCE OF SOUSSE	
Sousse Stockage C.St	220,000
Sousse Achats	3,000
Kalaa Schira	80,000
Enfidha	10,000
Kalaa Kebira	18,000
M'Saken	1,200
Bou Ficha	6,000
SUB-TOTAL	338,200

PROVINCE OF MONASTIR	
Monastir	700
Djemmal	800
Moknine	1,000
SUB-TOTAL	2,500

PROVINCE OF MAHDIA	
Mahdia	3,000
El Djem	11,000
Souassi	10,000
Souk Habira	5,000
Ksour Essaf	3,000
SUB-TOTAL	32,000

PROVINCE OF MEDENINE	Capacity
Medenine	12,000
Djerba	1,500
Zarzis	700
Tataouine	400
Ben Gardane	800
Ghomrassen	500
SUB-TOTAL	15,900

PROVINCE OF KAIROUAN	Capacity
Kairouan	21,000
S.Amor Bou Hajla	19,500
S.Ali Nasrallah	13,000
Sbikha	15,000
Ousseltia	20,000
Haffouz	14,000
El Alaa	17,000
Hadjeb El Aioun	17,500
SUB-TOTAL	137,000

PROVINCE OF KASSERINE	
Kasserine	18,000
Feriana	11,000
Sbeitla	18,000
Sbiba	18,000
Thala	20,000
Haidra	600
SUB-TOTAL	85,600

PROVINCE OF GAFSA	
Gafsa	4,500
Tozeur	2,000
El Guettar	1,000
Nefta	500
SUB-TOTAL	8,000

PROVINCE OF S.BOU ZID	
Sidi Bou Zid	8,000
Djimla	9,000
Maknassy	1,000
Bir El Haffey	1,000
Sidi Ali Ben Aoun	2,400
Regueb	3,000
Mezzouna	7,000
SUB-TOTAL	31,400

PROVINCE OF SFAX	
Sfax Stockage C.St	140,000
Sfax Achats	2,000
Djebeniana	4,000
Menzel Chaker	12,000
B.Ali Ben Khelifa	1,500
Mahres	800
Hencha	3,000
Skhira	300
Kerkena	300
SUB-TOTAL	170,900

PROVINCE OF GABES	
Gages Stockage C.St	70,000
El Hamma	1,000
Matmata	400
Kibili	600
Mareth	500
Douz	500
SUB-TOTAL	73,000

TABLE 4. TUNISIA

TERMINAL ELEVATOR CAPACITIES

Operated by Office of Cereals	
Tunis P.V.C. St	140,000 Qx.
Djebel Djelloud	160,000
Bir Kassaa	250,000
Ebba Ksour	295,000
Sousse	220,000
Sfax	140,000
TOTAL	1,205,000 Qx.
Operated by Grandes Cultures Cooperative	
Djebel Djelloud	700,000
Manouba	600,000
Bizerte	200,000
TOTAL	1,500,000 Qx.
Operated by COCEBLÉ Cooperative	
Megrine	120,000
Djebel Ouest	400,000
Bou Salem	110,000
TOTAL	630,000 Qx.
Total Terminal Capacity	3,335,000 Qx.

TURKEY

No data on total farm or village level storage or on private traders or processors' capacities are included here. Farmers usually store 3-10 M.T. of bulk grain in rooms of the home. In some areas wooden structures raised off the ground with 5-10 M.T. capacity are used. Underground pits of about 10 M.T. capacity are used in certain areas also with a few pits of 100 M.T. capacity. Traders store grain in bulk in large rooms whereas processors store in metal or concrete bins or in warehouses in bulk.[1)]

Data are presented from two sources showing capacities of grain storage facilities operated by the government-owned TOPRAK MAHSULLERI OFISI (T.M.O.) in 1969 and 1974 to be in close agreement (1969- 1,717,810 M.T.; 1974- 1,752,120 M.T.). Over half of the increase in capacity can be accounted for by a 20,000 M.T. concrete silo constructed at Haydarpasar in 1972.

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1) Krishnamurthy, K. (1969) Marketing and Storage of Grain in Turkey Bulletin of Grain Technology 7(4):222-228.

TURKEY

FOODGRAIN STORAGE STRUCTURES OF T.M.O.[1] IN DIFFERENT ZONES

	Type		Istanbul	Diyarbakir	Samsun	Erzurum	Ankara	Afyon	Izmir	Konya	Iskenderum
1.	Concrete Silos	Number	3	2	1	2	5	2	1	6	2
		Capacity	48,000	9,000	4,000	14,000	86,000	9,000	20,000	80,400	120,000
2.	Steel silos	Number	6	9	9	4	23	3	1	14	--
		Capacity	20,000	78,000	36,000	18,000	188,000	30,000	12,000	103,000	--
3.	Corrugated metal bins	Number	--	--	51	140	29	31	1	--	--
		Capacity	--	--	4,590	12,600	2,618	2,790	90	25,930	--
4.	Steel warehouses	Number	73	73	54	53	36	18	1	--	9
		Capacity	84,000	78,000	64,000	69,000	36,000	20,000	7,000	63,500	91,000
5.	Stone and concrete warehouses	Number	4	9	14	14	19	29	--	--	7
		Capacity	4,500	16,500	20,500	9,500	36,500	37,500	17,000	50,500	27,000
6.	Wooden warehouses	Number	1	--	3	--	8	--	1	--	1
		Capacity	5,000	--	6,000	--	6,000	--	500	4,500	1,000
7.	Other types of storage	Number	7	1	--	--	4	1	--	--	--
		Capacity	9,000	2,000	--	--	3,800	1,000	--	--	--
	TOTAL CAPACITY[2]		170,500	183,500	132,690	123,100	383,910	100,290	56,590	328,230	239,000

SOURCE: Krishnamurty, K. (1969) "Marketing and Storage of Grain in Turkey" Bulletin of Grain Technology 7(4): 222-228.

[1] T.M.O. TOPRAK MAHSULLERI OFISI

[2] Total Capacity of all structures - 1,717,810

TURKEY
TMO COVERED STORAGE CAPACITY BY REGION AND TYPE

Region	Silos				Flat stores		Steel Tanks	Total Capacity	Usable Capacity
	Concrete	Steel	Wood	Total	Masonry and wood	Steel			
Istanbul	54,500	20,000	4,500	79,000	13,700	87,000	-	179,700	169,700
Izmir	20,000	16,700	-	36,700	12,630	8,000	-	57,330	52,200
Afyon	9,000	30,000	-	39,000	39,550	22,000	2,790	103,340	96,690
Ankara	86,000	186,000	-	272,000	47,300	60,000	2,610	381,910	373,910
Konya	80,400	100,600	-	181,000	56,500	66,000	24,120	327,620	319,480
Iskenderun	120,000	-	-	120,000	27,000	124,000	-	271,000	254,000
Sansun	4,000	34,000	-	38,000	23,500	58,500	4,230	124,230	118,975
Erzerum	14,000	18,000	-	32,000	9,500	59,000	13,770	114,270	109,590
Diyarbakir	9,000	84,000	-	93,000	18,000	81,000	720	192,720	186,880
Total	396,900	489,300	4,500	890,700	247,680	565,500	48,240	1,752,120	1,681,425

SOURCE: FAO, Commodities and Trade Division, 1974

TURKEY
TMO CONCRETE SILOS

Location	Capacity Tons	Year of Construction	Machinery Supplier
Yerkoy	10,000	1936	MIAG
Haydarpasar (Istanbul)	34,000	1956	"
Izmir	20,000	1958	"
Ankara	60,000	1958	Simon
Konya	60,000	1958	"
Iskenderun	20,000	1958	MIAG
Trabzon	10,000	1958	"
Mersin	100,000	1962	Simon
Haydarpasar	20,000	1972	"

SIZE AND REGIONAL DISTRIBUTION OF COLUMBIAN STEEL SILOS

Region	Number of silos of capacity (tons):							
	2,000	4,000	6,000	8,000	10,000	12,000	16,000	20,000
Istanbul	3	2	1	-	-	-	-	-
Izmir	-	1	-	-	-	1	-	-
Afyon	-	1	1	-	-	-	-	1
Ankara	7	5	2	1	2	-	2	4
Konya	2	4	1	-	5	-	1	-
Iskenderun	-	-	-	-	-	-	-	-
Samsun	3	3	1	-	-	-	-	-
Erzerum	1	1	2	-	-	-	-	-
Diyarbakir	4	3	-	1	-	-	1	2

SOURCE: FAO, Commodities and Trade Division, 1974